University of Alberta

Smart Arts:
Applying Digital Technology to Increase Engagement and Value in Museums and Historic Sites

by

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Abstract

The emphasis in the definition of a museum is changing, as exemplified by the differences in the museological approaches between two editions of Alberta's Standard Practices Handbook for Museums and recent articles in museological periodicals. The new focus on serving society, combined with modern computer design, developments in humanities computing, and international examples of smart museums create the potential for smart innovations in Alberta's arts museums regarding gallery exhibitions, collections conservation, publication, and the relationship between museums and society. Fort George and Buckingham House Provincial Historic Site, the Royal Alberta Museum, and the Art Gallery of Alberta represent a spectrum of arts museums. They share common concerns related to offering more interpretive information, digitization of inventory and metadata files, website publication, resource rooms, monitor faces and interfaces in gallery displays, and investing resources in digital materials development. The resource room and the website offer unprecedented opportunities for information dissemination, but the gallery offers the immediacy of proximity to actual art and artifacts. Their juxtaposition and synthesis make each more powerful and more valuable.

Dedication

I dedicate this book to my wife

Darlene Marion Robinson Ackroyd

for all the years of support she has given me

and for the personal sacrifices which she has made

to facilitate my education

and make this thesis possible.

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Abbreviations

3-D	Three-Dimensional Graphics
AGA	The Art Gallery of Alberta
AICT	Academic Information and Communication Technologies
Blog	Web Log
CD-ROM	Compact Disc-Read Only Memory
CF&HR	Cultural Facilities and Historical Resources
CHIN	Canadian Heritage Information Network
CPU	Central Processing Unit
CULTNAT	The Centre for Documentation of Cultural and Natural Heritage
DNA	Deoxyribonucleic acid
DVD	Digital Versatile Disc (formerly Digital Video Disc)
FG&BH	Fort George and Buckingham House Provincial Historic Site
GIS	Geographic Information System
Handbook 1	Standard Practices Handbook for Museums (1990)
Handbook 2	Standard Practices Handbook for Museums: Second Edition (2003)
HTML	Hypertext Markup Language
HUCO	Master of Arts in Humanities Computing
IBM	International Business Machines Corporation
ICM	International Council of Museums
MACT	Master of Arts in Communications and Technology
NASA	National Aeronautic and Space Administration
OCR	Optical Character Reader
PDF	Portable Document Format
RAM	Random Access Memory
R.A.M.	The Royal Alberta Museum
SGML	Standard Generalized Markup Language
StatCan	Statistics Canada
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPC	Universal Product Code
URL	Uniform Resource Locator (web page address)
V&A	Victoria and Albert Museum
VMC	Virtual Museum of Canada
WWW	World Wide Web

I
INTRODUCTION AND LITERATURE REVIEW

Sir Kenneth Clarke, the art historian and museum director, said that he did not know how to define civilization, but that he knew it when he saw it.[1] However, civilization is not in the art and artifacts in which Clarke recognised it, but in the value placed on those artifacts by the society that produced or preserved them. Those objects were merely representatives or symbols of civilization. Harold Innis[2] or Marshall McLuhan[3] might have called them the media of civilization. Civilization has always been mediated by arts and literature. The Library of Alexandria survived far beyond the Hellenistic civilization that created it, but the time came when a sultan of Egypt, by some standards less civilized than his Ptolemaic antecedents, saw no value in the scrolls other than to fuel the baths of Alexandria.[4] The loss of value in the scrolls and artifacts to that culture resulted in an inestimable loss to humanity's heritage.

Technology is not the measure of civilization, and it often continues far beyond the disintegration of the civilizations from which it has emerged. Digital technology is widely used to preserve an archival record of our cultural heritage, but it can also be a medium to preserve the value of artifacts far beyond their source civilization. In the words of a leading market researcher, "the key to creating value lies in designing meaningful experiences."[5] In addition to digital archives, computer technology may, if effectively utilized, be a means of preserving value in these products of civilization, by powerfully engaging

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[1] Kenneth Clarke, *Civilisation* (London: BBC, 23 February 1969).
[2] Harold Innis, *The Bias of Communication* (Toronto: University of Toronto Press, 1951).
[3] Marshall McLuhan, *Understanding Media. The Extensions of Man* (London: Routledge, 1964).
[4] Preston Chesser, "The Burning of the Library of Alexandria," *ehistory@Ohio State University*, 2006, 24 April 2006 <http://ehistory.osu.edu/world/articles/ArticleView.cfm?AID=9>. Chesser attributes the destruction of the library to three events: Julius Caesar's first Century BC burning of the Egyptian fleet which spread to the library, 4th century AD religious civil war in Alexandria and finally Caliph Omar's 640 AD burning of the remnants to heat the baths.
[5] Darrel Rhea, "Understanding Why People Buy," *Insight, BusinessWeek online*, 9 August 2005, 3 May 2006 <http://www.businessweek.com/innovate/content/aug2005/id20050809_077337.htm>. Darrel Rhea is CEO of the Cheskin market research firm and "one of America's leading strategic design consultants" for Pepsi, Kraft USA, General Foods, 3M, Motorola, etc. and lectures regularly at the Design Management Institute and the Art Centre College of Design.

viewer/participants in meaningful, interesting, reliable, educational, and dynamically growing digital interactivity with our cultural heritage.

A. Research Objectives

The goal of this study is to explore specific digital technologies as a means of enhancing the value of artistic and historical collections in museums. The improving visual display direction of twenty-first-century technology presents exciting possibilities for arts museums and historic sites in the new millennium. Computer graphics are no longer limited to low-resolution images crammed into an 800-by-600-pixel monitor. This technological development creates an affordance for arts and cultural museums and historic sites that has not been fully exploited. Greater potential now exists for visual impact through the use of the modern large-screen, high-resolution computer monitor as a standard museum display medium for the labeling, describing, and exploring of museum art and artifacts on display and for the interactive use of museum patrons to explore the museum's vast archival data and other resources.

As part of the exploration of effective use of digital technology in arts museums, I will address some of the reasons for ambivalence toward it. Because of the complexity of the issues, the analysis of why gallery deployment of digital technology is underutilized in a gallery setting is neither exhaustive nor definitive, but important to understanding effective deployment. Digital technology has been applied in a variety of ways in science-and-technology museums, sometimes very successfully, where computers have been used as a medium through which context, interaction, and further information can be displayed to enhance exhibit items or concepts. There remain enormous advantages, as yet largely unexploited, in the application of computers as interactive media for the enhancement of the visitor experience of art, artifacts, and historical/cultural displays in arts-and-humanities museums and at historic cultural facilities such as interpretive centres on historic sites. Hypermedia access affords museum patrons choices about the depth and breadth of available information they may wish to access. Digital mutability extends pedagogical

flexibility to meet differing learning styles and levels of maturity. The computer also offers new ways of resolving the difficult curatorial issues of preservation and restoration, while offering patrons multiple digital alternatives of restorations without irreparable intervention to the actual artifact.

I will compare both the overlapping and distinct utilizations of digital technology appropriate to gallery, museum resource-room, and virtual museum settings. Providing engagement through visually dynamic, aesthetic, user-friendly, digital interactivity will be a matter not only of investing in digital display technology, but of taking great pains to utilize it to its incredible capacity to positively impact the viewer/participant. To accomplish this, museum managers and designers must plan not only for the large-scale utilization of computer technology in the immediate future, but the investment in technical and creative design staff to build, support, maintain, and develop the digital resources this technology has the potential to display. The investment will pay dividends not only by more fully engaging patrons of museums and other historical and cultural facilities, but also in the preservation of value, through that engagement, in the very civilization of which art and historical artifacts are the remnants.

I am motivated by my own interests in and love for art and history and by my daily interaction with digital information delivery to carefully explore their junctions and potential junctions. As a university student in Paris some years ago, I remember being told of the negative reaction to the first introduction of electrical lighting into the Louvre Museum. Some thought it would distort the colours in comparison to the natural lighting from windows and skylights. Others were appalled by the thought of visible wiring so often seen in such installations in the late nineteenth century. An integrated design plan and careful craftsmanship made the new invention almost unnoticeable to the visitor. In the twentieth century controlled lighting was an essential aspect of museum and gallery design. Computer technology will be as ubiquitous and essential an element of display in the museum of the future as electric lighting is at present.

B. Research Approach

In approaching this subject, I have sought museological orientation through carefully comparing two editions of the *Standard Practices Handbook for Museums*.[6] Other sources have included peer-reviewed museological periodical and e-journal articles within the last six years dealing with computer interaction and museum design, books from the University of Alberta libraries related to the philosophical issues of museology and Humanities Computing, and periodic Internet searches and references from my own library for specific details during the course of the writing. Government and institutional statistics have been accessed from online sources through the University of Alberta library portal and by direct request of specific institutions. I have also conducted personal on-site interviews of museum curatorial and administrative staff in Edmonton and Portland.[7] For these interviews I selected three very different Alberta institutions as representatives of the wide spectrum of arts museums, in both size and orientation.

The Royal Alberta Museum, former Provincial Museum of Alberta, is a large, general museum. It is open all year, exhibits a broad range of display subjects in both permanent and changing galleries, and attracts a very wide audience. I recorded interviews with the following museum staff: Alwynne Beaudoin, Head Curator of Earth Sciences, Palaeoenvironmentalist, and museum "web master;" Susan Berry, Curator of Ethnology; Jack Brink, Curator of Archaeology; Mike Luchanski, Head of Collection Services and Collections Manager; Sean Moir, Curator of Military and Political History; Jane Ross, Curator of Western Canadian History; Mark Steinholber, Head of Life Sciences and Curator of Ichthyology and Herpetology; Tim Willis, Assistant Director of the Renewal Project (museum expansion); and Robin Wywal, Admissions Supervisor.

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[6] Dianne R. Smith, *Standard Practices Handbook for Museums*, (Edmonton: Alberta Museum Association, 1990); and Anne Hayward, *Standard Practices Handbook for Museums: Second Edition*, (Edmonton: Museums Alberta, 2003).

[7] The University of Alberta Arts, Science & Law Research Ethics Board issued a one-year certificate of approval for *Fully-Detailed Research Project* involving human participants, 2 May 2006. For full documentation see appendix E.

The Art Gallery of Alberta, former Edmonton Art Gallery, is a medium-sized, subject-specific, urban institution. Also open all year, it attracts a significantly smaller audience to its changing exhibits. My on-site interviews included Tony Luppino, Executive Director; Catherine Crowston, Deputy Director and Chief Curator; Ruth Burns, Curatorial Assistant; Pam Clark, Assistant Registrar/Visual Resources Coordinator; Ron Gregg, Director of Administration; and Marcus Miller, Assistant Curator and Public Programs Manager.

Fort George and Buckingham House is a rural historic site with a very small interpretive centre. The interpretive centre has limited exhibition space and is open for less than four months of the year, operated by seasonal staff. At the Historic Sites and Cultural Facilities offices I was able to interview Gary Duguay, Manager of Northern Operations and Central Services; Marianne Mack, Facility Supervisor of Fort George and Buckingham House; Carol Wilkinson, Head of Collections Management; and Becky Dahl, Curator of Northern Historic Sites.

An opportunity to visit The Portland Art Museum in Oregon coincided with the interview period of my research. The Portland Art Museum is comparable to the Royal Alberta Museum in size, with extensive permanent galleries and changing special exhibit galleries. Like the Art Gallery of Alberta it is focused on visual arts exclusively. Because of time limitations I was only able to interview Michael Smith, Gallery Display Graphic Designer, and a docent who wished to remain anonymous.

C. Museum Definition

The word, "museum," an ancient term for a temple of the Muses, has become broadly used to apply to any designated place for the collection, preservation, study, and/or presentation of any aspect of our cultural or natural heritage. The name has been applied to acres of open-air museum or to an intimate, single room so designated, and institutions ranging in subject matter from art galleries to zoos. As a point of departure in outlining museum function, both the Canadian Museum Association and the Alberta Museum Association

have adopted the definition used by the International Council of Museums (ICOM):

> A museum is a non-profit making, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of people and their environment.

Further elaboration to this statement specifies such varied institutions as

> Natural [. . .] and historical monuments and sites, [. . .] botanical and zoological gardens, aquaria and vivaria; science centres and planetaria; non-profit art exhibition galleries; [. . .] ministries or departments or public agencies responsible for museums [. . . and] institutions or organizations undertaking conservation, research, education, training, documentation and other activities relating to museums and museology.[8]

There is room within this definition for both the steadfastly conservative traditional museum and the extreme avant-garde. Despite the statement by the Operations Manager that Fort George and Buckingham House was "an interpretive centre rather than a museum,"[9] or the insistence by its Executive Director that The Art Gallery of Alberta is "a gallery and not a museum,"[10] they are both included within the ICOM definition.

Time and context have changed the connotation of that definition and the purpose of museums. The ICOM definition specifies five functions of a museum: it "acquires, conserves, researches, communicates and exhibits [. . .] material evidence." There is an obvious sequential order to this list, based on the traditional focus of museology on the artifacts and objects of collections. Dianne Smith's edition of the 1990 *Standard Practices Handbook for Museums* (*Handbook 1*) reflects this orientation on objects in both the structure and content of the volume.[11] The first chapter, "Administration," repeatedly lists these functions of

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[8] International Council of Museums, *ICOM Statutes, Article 2 – Definitions.* (Paris: ICOM, 2001), 25 August 2006 <http://icom.museum/statutes.html>.
[9] Gary Duguay, personal interview. 24 May 2006.
[10] Tony Luppino, personal interview. 5 July 2006.
[11] Dianne R. Smith, *Standard Practices Handbook for Museums* (Edmonton: Alberta Museum Association, 1990). Smith focuses the function of each section on objects, occasionally emphasizing them as "the real thing" (185) or "real objects," (228).

a museum in relation to purpose and policy statements.[12] The subsequent chapters deal with the five functions separately: "Collections Management," "Conservation," "Research," "Public Programming," and "Exhibition." More than a decade later, Anne Hayward's 2003 *Standard Practices Handbook for Museums: Second Edition* (*Handbook 2*) shifts the emphasis in the ICOM definition from "material evidence" to the earlier phrase, "institution in the service of society."[13] As a preface to her quotation of the definition, she stressed,

> A museum's primary responsibility is to serve the public through the preservation, study and interpretation of natural and cultural heritage. [. . .] The collections are not maintained as ends in themselves, but are a means of creating opportunities for public education and enjoyment."[14]

This subsumption of the collection, as a medium of heritage transmission, to the public service is reflected in both the organization and content of the volume, divided into four units: "Museums and Society," "Administration," "Collections," and "Programming."

As a result of this refocus, a recurring theme of the *Handbook* 2 is "public trust," defined as "the obligation shared by the museum's governing authority and its staff to serve the public interest."[15] It is manifest as a defining element not only of museums in relation to society: "Museums and Public Trust,"[16] but of each of the sub-chapters on museum functions: "Collections and Public Trust,"[17] "Conservation and Public Trust,"[18] "Research and Public Trust,"[19] "Programming and Public Trust,"[20] "Exhibits and Public Trust,"[21] and "Publications and Public Trust."[22] This may seem to belabour the point, but applying this change in definition focus to each museum function is germane to a

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[12] D. Smith uses "acquiring" and "collection" interchangeably as well as "preservation" and "conservation," and substitutes "interpretation" for communicates (40 and 43).
[13] Anne Hayward, Standard Practices Handbook for Museums: Second Edition (Edmonton: Museums Alberta, 2003).
[14] Hayward 28.
[15] Hayward 206.
[16] Hayward 31.
[17] Hayward 149.
[18] Hayward 206.
[19] Hayward 224.
[20] Hayward 251.
[21] Hayward 314.
[22] Hayward 358.

discussion of digital technology as a museum display medium. A definition that recognises the museum itself "as a medium for meaning-making in the community,"[23] also leaves room for new media that can assist in fulfilling that public trust. Hayward sums up her discussion of "A Vision for Museums" in these carefully chosen words:

> Collections and exhibits can be seen as vehicles for the expression and examination of cultural values. This view places museums at the centre of a cross-cultural exchange, where interpretation and mediation take precedence over collections management [. . .] and transforms museums from organizations that serve their collections to institutions in the service of society.[24]

For the purposes of this discussion I will employ the common academic taxonomy of arts and sciences to divide museums into two categories. Under the category of arts-and-humanities museums, or arts museums, I include public art galleries, art museums, cultural museums, human history museums, general museums, community museums, and historic sites. Under the category of science-and-technology museums I include space and science centres, technology museums, natural history museums, paleontology museums, science museums, natural science museums, conservatories, vivaria, planetariums, and observatories. In making this arbitrary division, I realise that many institutions do not fit neatly or clearly into one or the other. For example, The Royal Alberta Museum has the Syncrude Gallery of Aboriginal Culture and the natural History Gallery that fall clearly on different sides of the divide.

This division is nevertheless important because of the perceived differences in the compatibility of computers with these two categories. Computers are often still perceived as new technology, at home among the displays of science-and-technology museums, but intruders into the setting of traditional arts-and-humanities museums. Because my focus is primarily the effective use of digital technology in arts museums, that perception is significant. For example, the Executive Director of the Art Gallery of Alberta recently expressed his deep reservations about the use of computers in an art gallery. Outside the exhibition

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[23] Hayward 29.
[24] Hayward 29.

of modern art forms in which digital technology is the primary medium or is otherwise integral to the art form, he saw the "intrusion" of either visual or textual information from a computer monitor as "conflicting with" the experience of art, "interfering" with the contemplative aesthetic atmosphere he felt an art gallery should offer.[25] Despite attempts to clarify my proposition, he repeatedly made negative references to office-style computer workstations scattered through a gallery. Such awkward applications were tried in the late eighties and nineties in attempts to appear technically "with-it." A far more subtle and integrated approach would need to be taken in order to appropriately meet the needs of an art gallery or arts museum. Poor or careless uses of this remarkably malleable tool abound, nevertheless, properly done, digital extensions and enhancements designed to complement, focus, and inform the visitors' appreciation of the art and artifacts exhibited, seamlessly integrated into the gallery display architecture, could be completely compatible with the aesthetic essence of a temple of the Muses.

D. Museological Issues

Peter H. Welsh, 20-year Curator of Anthropology at the Southwest and Heard museums, and Arizona State University coordinator of Museum Anthropology, recently proposed "re-configuring museums"[26] along more anthropological lines. In his proposal, Welsh examined museum theory and practices historically, currently and potentially, under three overlapping and interrelated categories: "materiality, engagement, and representation."[27] His three "domains" correspond roughly to the units: "Collections," "Programming," and "Museums and Society," respectively, in *Handbook* 2. His documentation of changes between historical and current museum theory and practice in the United States also mirror many differences in theory and approach between *Handbook 1* and *Handbook* 2. Following the examples of Welsh

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[25] Tony Luppino, personal interview, 5 July 2006.
[26] Peter H. Welsh, "Re-configuring museums," *Museum Management and Conservatorship*, 20 (2005): 103-130, 10 Oct. 2005 <www.elsevier.com/locate/musmancur>.
[27] P. Welsh 104.

and Hayward, I will cluster the museological issues in this section into three sub-sections. *Museums and Society* will look more closely at the transitions in museology and social epistemology in relation to digital communication. *Collections* will review the unresolved issues of conservation and restoration, and suggest digital alternatives. *Programming* will examine issues of digital technology related to public access, pedagogy, exhibition, and publication.

1. Museums and Society

According to *Handbook* 2, museums serve an important social role. "Museums reflect the cultures they represent, and serve as foundations for collective memory, continuity, and social development."[28] Seen in this light, museum collections take on the essential role of memory mediation, and interpretation becomes a two-way medium for communicating continuity. Contrary to the traditional role, Hayward asserts,

> Museums are not repositories for artifacts, but socially responsive institutions dedicated to preservation, exploration, and communication. [. . .] In place of the ivory tower, the museum becomes a hospitable place where knowledge is shared and meaning is create in a climate of mutual trust and respect."[29]

a. Authoritarian or Responsive

Mutual trust and respect have not always characterised the climate between museums and society. Museums have sometimes manifested a degree of institutional conceit. Arts Museums have traditionally been seen as established, authoritative, collectors of rare, exceptional, or significant historical and cultural artifacts, or as exhibitors of aesthetically superior works. Many older museums began as private collections and have grown to be elite symbols of national, regional or ethnic pride.

Welsh argued that American museums have traditionally represented themselves in a "celebratory" aspect, by which they assume that the preservation of the treasures in their collections, the expertise of their staff or the

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[28] Hayward 25.
[29] Hayward 25.

themes of particular exhibits are intrinsically worth celebrating by any "responsible member of modern society."[30] He demonstrated that this approach is giving way to more collaborative activity, both between curators and museum advisory groups, and between curators and the visitors, eschewing the imposition of institutional meanings in favor of extending value-ascribing participation and even "memory stewardship" to museum patrons.[31] Welsh recommended being more representationally "reflexive," allowing the visitors and staff to dialogue in a meaningful and constructive interpretation of artifacts and exhibitions.[32]

Yasser Mansour, coordinator of the Grand Museum of Egypt Project, asserted that the diversity and mutability of contemporary cultures and societies make the traditional roles of the museum, historically assumed by museum designers and directors, untenable.

> The traditional concept of a museum [he defined] as the cultural resource place of an educated and sophisticated elite, devoted to the preservation and safeguarding of the cultural messages inherent to the objects it houses but also 'as the repository and arbiter of philological knowledge, as a mono-functional, scientific institution, a source of authority and the sole judge of its specific practices.'[33]

This traditional elitist, arbitrary, and authoritarian role is untenable because the twenty-first-century museum audience is no longer the product of an aristocratic European liberal-arts tradition. Established cultural authority no longer commands unquestioned respect. Current news stories and entertainment genres daily attest to the widespread disrespect of today's public for authority assumed by anyone: individuals or institutions, public or private.

Because museum, gallery, and historical collections and exhibitions are considered a public trust, museum visitors are not satisfied to simply be lead through a display of final conclusions drawn by authoritative sources. They want to participate, even if second hand, in the process of cultural canonization. The issue of public accountability is measured in more than fiscal terms. The twenty-

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[30] P. Welsh 111-112.
[31] P. Welsh 115.
[32] P.Welsh 120.

first-century public gauge museum accountability in terms of accessibility to "collections, decision-making processes, and resources."[34] Modern pedagogical philosophy encourages alternative interpretations and informed choices. Unfortunately, the desire to explore alternative narratives and draw private conclusions is sometimes seen as a threat to institutional authority. In her 1997 book, *From knowledge to narrative: Educators and the changing museum*, Lisa Roberts addressed this tension.

> Museums have by tradition upheld an information-driven way of knowing that is accredited by established standards of proof and reliability. To allow for and even to encourage alternative ways of interpreting and experiencing collections represents a challenge not only to museums' power and authority over the object and its display, but also to the very basis and credibility of the knowledge that museums presume to possess.[35]

It is this presumption of exclusive authority and knowledge that is questioned by the epistemological inquiry of a skeptical and questioning public. The choices of what is on display and how they are displayed are fundamental cultural messages of museums, galleries, and historic sites. Public participation and interaction with cultural resources is therefore a core issue in the relationship of museums and society. Hence, the flexibility of digital interactivity to facilitate audience participation on many levels is crucially material to the issue of our heritage and how we access it.

b. Changing Social Epistemology

Developments in telecommunications and information technology are becoming the definitive cultural characteristics of our society, fueling the very speed of social and cultural changes. Digital multimedia and electronic information networks (including the Internet) are becoming the primary vehicles for the exchange of information and dissemination of cultural content.[36] Many

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[33] Yasser Mansour, "The Grand Museum of Egypt Project: architecture and museology," *Museum International*, 57.1 (2005): 40.
[34] Hayward 26.
[35] Quoted in P. Welsh 111.
[36] Fathi Saleh and Hala N. Barakat, "The Global Village of Heritage: the contribution of the Centre for Documentation of Cultural and Natural Heritage (CULTNAT)," *Museum International*, 57.1 (2005): 73.

prominent social theorists link the "information revolution" to the unfolding of such intellectually debated phenomena as "postinternational politics," "postindustrialism," and "postmodernism."[37] Twenty-first-century museum visitors shape and are shaped by these developments.

Following in the footsteps of communications-media theorists Harold Innis and Marshall McLuhan, Ronald J. Deibert linked the digital revolution with fundamental "world order transformation."[38] In a detailed historical comparison, he analyzed the impact of printing and book publication on the social, political, and epistemological transformations of Europe from the medieval order to the modern nation-state order, equating it to the impact of digital hypermedia communication on the comparable transformations from nationalist world order to the international economic and global civil orders emerging today.[39] New ideas or institutions are not necessarily spawned by new communication systems, Deibert clarified, but "symbolic forms, social constructs, or cognitive biases [and other] elements of social epistemology present in society will tend to flourish or wither [over generations] as a result of a fitness between those elements and the new media environment."[40] According to this model, the preservation of epistemological perspectives, philosophical views, and social values will depend on developing a niche in which to flourish within the new communications environment where sovereignty, autonomy, and authority are marginalized.

The implications for museology arising from the Deibert model are twofold: transmission and translation. As industrialized humanity passes through a cultural, social, and economic transition comparable to the European Renaissance and Reformation, there is a need to preserve and transmit not only objects but also enormous cultural data to both the transition and post-transition museum visitor. Yet, museums, libraries, and universities, as we have known them, along with the collections, values, traditional practices, and functions of which they are

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[37] Ronald J. Deibert, Parchment, Printing, and Hypermedia: Communication in World Order Transformation (New York: Columbia UP, 1997) 3.
[38] Deibert 4.
[39] Deibert 163-164.
[40] Deibert 142.

constituted, are all products of the book-focused social epistemology that arose from the last great transition. The effective transmission of past civilization to future generations will require the translation, not only of the artifacts and their contextual meaning, but also of the very institutions of transmission, into a form compatible with the communications environment in which the future audience is comfortable or capable of receiving the transmission. The museum must develop its niche as a medium of "collective memory, continuity and social development"[41] within the digital communications environment.

Responding to these information-age issues, *Handbook 2* placed much more emphasis on communication, learning, and publication as essential means to fulfilling its public trust obligation. In the discussion of museum communication, Hayward identified several manifestations of the focus shift from "material evidence" to "the service-of-society."[42] The importance of communications expertise is rising to parallel that of curatorial and conservation expertise, in the recognition that the carefully conserved and researched contents of collections become meaningful and valuable to the public only through effective communication.[43] Driving this human resources shift is the new priority of collections access over collections preservation: access not only to exhibits, programs or publications, but also to administrative and curatorial decisions, information resources, and physical resources "from gallery space to the repatriation of cultural artifacts."[44] Hayward advocated taking advantage of communications technologies to extend greater access, while maintaining a consistent institutional identity by adhering to a communications plan.[45] She contrasted the traditional one-way "sender to receiver" communications model with the collaborative "fields of meaning" model, where visitors participate in the creation of "multiple–even conflicting–interpretations" of meaning. Though this modular format departs from the linear narrative of traditional exhibits, it

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[41] Hayward 25.
[42] ICOM definition.
[43] Hayward 43.
[44] Hayward 43.
[45] Hayward 45.

offers more opportunities for visitors to participate and relate, and offers curators more flexibility in meeting varied learning styles and interests.[46]

Some museum curators and administrators steeped in the material-evidence museological focus, or who define their role within the autonomous and authoritarian social epistemology of the book, may sometimes perceive these priority realignments as threatening or even demeaning. Their antipathy to museological refocus, or the flexible and collaborative social epistemology of hypermedia, is often transferred to the computer medium itself, resisting a vehicle that facilitates these innovations. However, the substance of computer-facilitated mediation is absolutely dependant on the expertise and direction of curatorial and administrative staff. Digital interaction does not replace art or other artifacts but serves as a medium augmenting and spotlighting the value of the collections, expertise, and interpretive functions of museums. Museums have always been mediated, from the verbal display of "paideia" by ancient Roman collectors[47] to the labels, didactic panels, and narrative arrangements of modern exhibits. Hayward's vision of museums, collections, and exhibits as "meaning-making" media, serving society by expressing and examining its heritage of cultural values,[48] in no way demeans conservation and curatorship, but elevates it to a higher social purpose.

2. Collections

Addressing "materiality," Welsh demonstrated the material shift in approach from collection ownership to stewardship, opening the museum to more interrelationships with cultural stakeholders outside the institution.[49] Museums have traditionally been the repositories of authentic originals, including some of humanities finest achievements, occasionally alongside historical relics of racism, imperialism, cultural exploitation, or any number of now-politically-incorrect

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[46] Hayward 44.
[47] Jas Elsner, *Imperial Rome and Christian Triumph*, Oxford, Oxford University Press, 1998, 106-110.
[48] Hayward 29.
[49] P. Welsh 113.

aspects of the past.[50] Welsh proposed that museums become semiotically "conceptual," materially disassociating display content from a single imitative context for the works on display.[51] His concept of stewardship is implicit in the relationship between collections and the public trust in Hayward's *Handbook* 2. She divided the "Collections" unit into three chapters: "Collections Management,"[52] "Conservation,"[53] and "Research."[54]

Jerome McGann addresses two of these issues directly in *Radiant Textuality*. Relating to the management of archival collections, he predicted "the complete editorial transformation of our inherited cultural archive" into digital form. He based his certainty of this eventuality on the overwhelming aptitude of the computer for "the editorial and archival function."[55] Applying the concept of textuality to art as well as literature, he demonstrated the interpretive potential of visual "deformance" as a digital research tool. The simple manipulation of Photoshop hue adjustments to digital scans of paintings in *The Rossetti Archive* revealed otherwise imperceptible compositional dynamics and subtleties.[56] A wide variety of scans beyond the human visual spectrum also offer avenues of historical research with Photoshop analysis.[57]

a. Conservation Semantics

The potential contributions of digital technology to conservation are controversial for both direct and indirect applications. The fundamental issue is often over whether restoration intervention is necessary, or whether a work of art should be conserved in its aged or damaged state. Art restoration is a major profession in Italy and a significant part of the art and museum complex

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[50] P. Welsh 109.
[51] P. Welsh 117.
[52] Hayward 149.
[53] Hayward 206.
[54] Hayward 224.
[55] Gerome J. McGann, *Radiant Textuality: Literature after the World Wide Web*, (New York: Palgrave, 2001) 18.
[56] McGann 84-85.
[57] Amanda Castleman, "Digital Imaging: The Fine Art of Restoration," *Wired*, Sep. 2003, 25 Jan. 2005 <http://www.wired.com/wired/archive/9.03/mustread_pr.html>.

throughout the world.[58] Yet among conservators there is not only a debate over techniques, but major disagreement on the terminology of the debate.[59] What a given writer means by these words is often dependent on the context and the school of thought from which the writing emerges. One school considers conservation as synonymous with restoration and another considers them antithetical. Restoration once meant the reconstruction of broken or missing pieces, restoring the work to the restorer's best estimate of its original state or artist's intent, while more recent interpretations insist on restoring the work to the original material. Conservation can mean both the repair and preservation of art in its current context, and the large-scale thorough cleaning of art, amounting to its restoration back to an historical condition, such as the controversial cleanings of the Brancacci and Sistine Chapels in the 1980s and 90s. Conservation, not always a term associated with art, was first used in the context of art preservation in 1930.[60] The idea of applying science to the art of conservation and/or restoration grew under the International Museums Office of the League of Nations, and later the International Council of Museums.

Late-twentieth-century examples of the polar shift in restoration interpretation include the Metropolitan Museum of Art's removal of the 1909 partial restoration of the face and breast from the life-size classic Roman sculpture of an *Old Woman*.[61] The plaster restorations had begun to darken over time. The face remains now only in historical photographs and vintage art history books. On the other side of the Atlantic, the Vatican's antique sculpture of *Laocoön and his Sons*, unearthed in 1506 with all the right hands missing, was restored with the dramatically extended right arm of Laocoön, and the upward reaching hands on his sons, by the renaissance sculptor Montorsoli. These

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[58] Robert Fulford, Art Restoration in Italy, (*Globe and Mail*, 11 Feb. 1998) 28 Jan. 2006 <http://www.robertfulford.com/restore.html>.

[59] Nicholas Stanley Price, M. Kirby Talley Jr., and Alessandra Melucco Vaccaro, *Historical and Philosophical Issues in the Conservation of Cultural Heritage* (Los Angeles, The Getty Conservation Institute, 1996) xiii.

[60] Philip Ward, *The Nature of Conservation, A Race Against Time* (Marina del Rey, The Getty Conservation Institute, 1986) 1.

[61] Dorothy H. Abramitis, "Statue of an Old Woman, A Case Study in the Effects of Restoration on the Visual Aspects of Sculpture," *The Metropolitan Museum of Art Bulletin* (Winter 1997/98) 30-37.

additions reflected more the mannerist taste of the restorer rather than the Hellenistic taste of the original sculptors[62] When Laocoön's actual bent arm was found in 1957, the Vatican faced a dilemma. The restoration paradigm shift meant a return to the original artifact. Ultimately the group underwent the removal of all three of the four-hundred-year-old finished marble arms and the placement of the one incomplete and corroded 1957 discovery (Figure 1).

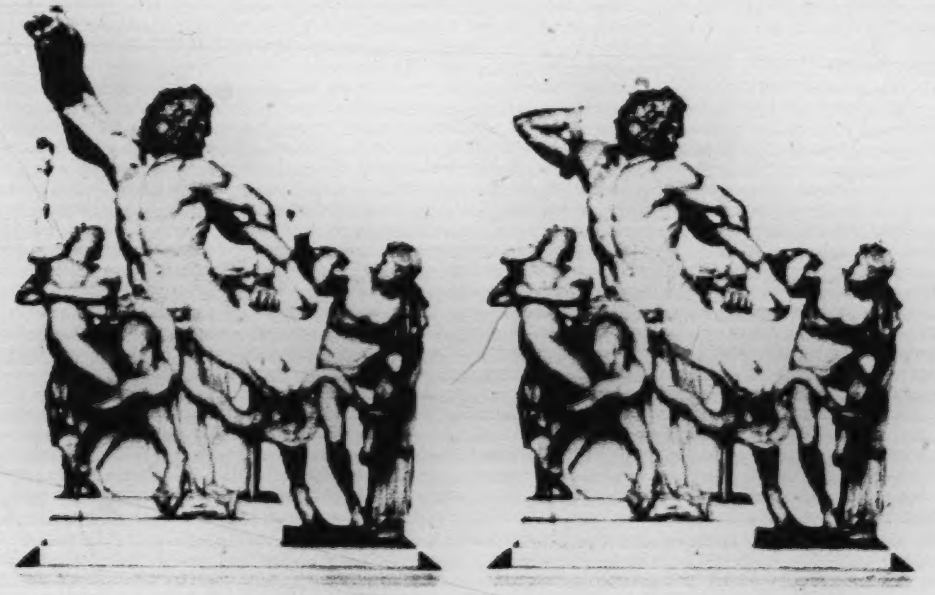

Figure 1: Laocoön and his Sons, traditional sixteenth-century restoration on the left and twentieth-century restoration on the right.[63]

The shift in the taste of art admirers has significantly influenced this issue. Ancient statues on the Parthenon were polychromed like old department-store mannequins, yet art connoisseurs from the renaissance to the last century would never consider repainting the Elgin marbles. An international furor was raised in 1998 over the revelation that these marbles had been "skinned" during the 1930s to remove the original polychrome, brownish natural patina, and accumulated London soot, to meet the whiter taste requirements of one wealthy and

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[62] Paul Philippot, "Restoration from the Perspective of the Humanities," *Historical and Philosophical Issues in the Conservation of Cultural Heritage*, (1996) 221, 222.
[63] Beard and Henderson 66. The author digitally enhanced the image on the left.

influential British Museum board member.[64] The possible restoration, based on analysis of subtle differences with casts taken from the marbles during the nineteenth century, would only further violate the "integrity" of what is left. The false noses and prosthetic limbs with which our ancestors piously restored statues in an effort to preserve the intent of the artist, modern conservators remove from them with an equal sense of piety, to preserve the integrity of the artifact.[65] Just as the influence of Rodin's deliberately incomplete sculptures raised modern viewers' appreciation of Michelangelo's unfinished sculptures,[66] the fragmented aesthetic of the twentieth century, expressed in modern art movements from cubism to neo-expressionism, and the ubiquitous influence of gestalt design theory, have cultivated a taste for the fractured, the wounded and the incomplete. The modern connoisseur often finds both identity and catharsis in the broken fragments of the past.

Integrity as an issue has been refined, over the last half century, along interpretive lines related to the issue of taste. Conservation theorists like Cesare Brandi and Paul Philippot have pointed out the "transient character of any restoration, even the most skillful, as it is always marked by the cultural climate in which it is carried out."[67] Like the Laocoön example, any reconstruction or even display of art from the past incorporates the cultural bias of the restorer or presenter. Objectivity is a worthy but ultimately a practically unattainable goal. The only sure way to avoid what Vaccaro called a "Disneyland" parody of the past is to minimize intervention and maintain the distinction between the artifact and the repair or the display mounting. A museum compromise is often the appearance of a complete reconstruction accompanying the display of the time

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[64] P. Betts, "Cleaning of the Parthenon Marbles: The 23rd British Museum Classical Colloquium," *Museum Management and Conservatorship* 18.4 (2000) 419-429. Betts reported on the issues raised by the publication of William St. Clair's *Lord Elgin and the Marbles*, the cover-up of the procedures, a comparison with the rotting marble still on the Acropolis, and a discussion of new techniques for cleaning that do not involve removing the surface.

[65] Marguerite Yourcenar, "That Mighty Sculptor,Time," *Historical and Philosophical Issues in the Conservation of Cultural Heritage*, (1996) 214.

[66] William Flemming, *Arts & Ideas*, New York, Holt, Rinehart and Winston, 1980, 396.

[67] Alessandra Melucco Vaccaro, "The Emergence of Modern Conservation Theory," *Historical and Philosophical Issues in the Conservation of Cultural Heritage* (1996) 207.

altered artifact, such as the British Museum's *Sutton Hoo Helmet* display.[68] There the fragments are displayed in proper relation to each other, mounted on a materially distinct helmet-shaped structure. The exquisite replica beside it demonstrates how the artifact could have appeared originally.

Nonintervention is also the safe path. If objectivity is difficult, unanimity is impossible. Heated debates and lawsuits have raised the tensions and the stakes over major restorations of art.[69] The 500-year-old varnish on the *Mona Lisa* has now yellowed to a dark brown film, and the wooden panel on which it is painted is split and warped,[70] but no conservator is willing to be charged with the mutilation of the world's most famous painting. The National Research Council of Canada's 3-D high-resolution colour scanner, capable of recording the most subtle layering of paint, has been able to identify the gauzy maternity veil over her dress and the cap-style bonnet on the back of her head which are now completely obscured beneath the dingy varnish, yet there is no talk of cleaning to allow the Louvre visitors to see the painting beneath. On "the principle of minimum intervention," the experts instead declare that "if current storage conditions are maintained, there is no risk of degradation."[71] Further degradation to the *Mona Lisa* may be held in abeyance within the protective-glass case in the *Salle des Etats*, but, ironically, the visitor's best view of Leonardo's painting may be via the medium of a digitally-enhanced poster available in the Louvre's souvenir shop.

Virtual restoration affords greater flexibility in interpretations both of the art object and of the theories of conservation. Large-screen, high-resolution monitors near the protective case could allow visitors to explore the fascinating research findings from the National Research Council's scans and the rational

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[68] Nigel Williams, "The Sutton Hoo Helmet," *The Art of the Conservator*, ed. Andrew Oddy, (London: British Museum Press, 1992) 86-88.
[69] James Beck, *Art Restoration, the Culture, the Business and the Scandal*, (New York: W.W. Norton & Company, 1993) 5-7.
[70] Stefan Lovgrin, "Warping Mona Lisa Nothing to Smile About, Experts Say," *National Geographic News*, 30 April 2004. 4 February 2005 <http://news.nationalgeographic.com/news/2004/04/0430_040430_monalisa.html>.
[71] Paul Gessell, "NRC scientists discover Mona Lisa secrets," *Canada.com*, 26 Sept. 2006, 30 Sept. 2006 <http://www.canada.com/topics/story.html?id=dd098037-dce6-4a6d-90de-88ccc05c9e57&k=96188>.

behind curatorial choices, or evaluate the relative merits of differing virtual restorations by various art historians and da Vinci scholars, while maintaining the no-risk condition of the original. In proverbial terms, digital restoration allows us to "have our cake and eat it too." Similarly, a detailed cyber model of the Laocoön group with correctly bent arms but all the fingers does not compromise the integrity of the marble original. In fact it may be a fascinating educational exercise for Vatican-Museum visitors to digitally compare the various restorations and replicas in their cultural and chronological context, including several finely executed polychrome possibilities of what different researchers envision an ancient visitor to Rhodes might have seen, complete with commentary about the reasons behind colour choices and applications.

b. Common Conservation Controls

Another issue is the need for common guidelines. Despite international conferences and associations, there remains a wide variance on several fronts. Hanna Jedrzejewska's paper on ethical concerns presents many good questions and even suggests some of the ethical guidelines that could answer them, but her views are not binding on anyone.[72] There is no world art tribunal to which one can take disputes. Nor do her suggestions fully take into account the discrepancies between conservation priorities as applied differently to paintings, sculpture, architecture, and archaeology. Andrew Oddy, Keeper of Conservation at the British Museum, speaks of rules such as "all added retouching should be reversible, or easily removable;" or the "six inch-six foot rule," which is that a repair should be oblivious to the casual observer six feet away but completely obvious to the expert at six inches; and the corollary materials rule, that repairs should avoid matching the exact material of the object lest it appear to be an attempted falsification. Yet he despairs of attempts to codify the rules "because the approach to conservation can never be generalized, and is very dependent on the aims of the particular museum and curator."[73]

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[72] Hanna Jedrzejewska, *Ethics in Conservation* (Stockholm: Kungl. Konsthogskolan, Institutet for materialkunskap, 1976).
[73] Andrew Oddy, *The Art of the Conservator* (London: British museum Press, 1992) 11-12.

Despite contrary voices,[74] the general trends in the course of the twentieth century were toward preservation rather than restoration, and a focus more on the integrity of the object over any perceived intent of the original artist. *Handbook 1* prescribes preventive conservation, which by "definition excludes restoration or conservation treatment,"[75] and quotes from the Canadian conservation code of ethics that "all intervention must respect the integrity of the object."[76] Smith's basic standards include preventing the acquisition of dirt or dust on objects and tolerate cleaning only if "visual integrity is impaired."[77] *Handbook 2*, while offering treatment conservation as an alternative to the strictly preventive measures of controlling light, temperature, and humidity to minimize deterioration, nevertheless advocates the minimum possible intervention.[78]

Moving beyond the mere integrity of the art objects, ArtWatch International published "A Bill of Rights for Works of Art."[79] In addition to the "inalienable right to live an honorable and dignified existence," the 1992 manifesto granted inanimate works of art "the right to remain in their original abode." Among its eleven points of assertion, the bill insisted on recognizing works of "the highest order" as the property of the "global cultural patrimony" rather than of separate nations or private collectors, who only "hold them under an enforceable constructive trust, for the benefit of the public," which stewardship "should be subjected to free and open debate, and appropriate judicial review." It insists that any preservation and conservation interventions and procedures first receive approval from "a court of competent jurisdiction" including second and third opinions, and "after any objector has been given the right to be heard."

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[74] M. Kirby Talley Jr., "The Original Intent of the Artist," *Historical and Philosophical Issues in the Conservation of Cultural Heritage* (1996) 162-174. Tally points out unresolved conflicts between the historical or implied intent of artists in direct opposition to the intended use by the original patron, subsequent collector, or the perceived preservation or display priorities of present conservators. Documentary evidence seems to contradict conservator views of tinted varnish achieving a deliberate aesthetic desire of painters, or justifying the varnishing of matt cubist works to more closely resemble their familiar glossy reproductions.

[75] D. Smith 141.

[76] D. Smith 144.

[77] D. Smith 156.

[78] Hayward 206-207.

[79] Elizabeth C. Welsh, *ArtWatch International* (12 Nov. 1993) 2-3. 12 Feb. 2005 <http://palimpsest.stanford.edu/bytopic/orgs/artwatch.html>.

Interventions should be in response to imminent danger and must never be undertaken for experimental, scientific, or profit motives. James Beck, the organization's director and Columbia University art historian, signed the revised document, dated "12/8/1992." This manifesto was meant to be a highly controversial document. Much of the vocabulary is not clearly defined and is often emotionally charged. It was obviously a reflection of the anti-restoration debate Beck championed throughout the 1980s and 90s. In general, the document represents the extreme voice among advocates of "age value," the appreciation of natural cycles of growth and decay, and the aesthetic contribution of time.[80]

The anti-restoration issue began with John Ruskin and William Morris in the nineteenth century, who held very Romantic views about "beautiful ruins." Eugene-Emmanuel Viollet-le-Duc was the grand architecture restorer of the day. Ironically both camps adored the Gothic, but expressed their adoration in diametrically opposed fashion. Viollet-le-Duc defined architectural restoration as the reestablishment of a building "in a finished state, which may in fact never have actually existed at any given time," by putting oneself "in the place of the original architect and try[ing] to imagine what he would do."[81] Morris considered the results of that exercise "a feeble and lifeless forgery."[82] The historical embellishment and additions that each century had contributed to old churches, which the "purist" imitators of Viollet-le-Duc wished to restore to some ideal Gothic state, held for Morris genuine artistic, historical and educational value and integrity with which no pretentious fabrication could compare. Ironically, age has masked the scars of the nineteenth century surgeries and modern tourists generally accept the restorations as original elements. But at the time Ruskin called these restorations "the most total

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[80] M. Kirby Talley Jr., "The Eye's Caress: Looking, Appreciation and Connoisseurship," *Historical and Philosophical Issues in the Conservation of Cultural Heritage*, (1996) 19.
[81] Eugene-Emmanuel Viollet-le-Duc, "Restoration" (1854), *Historical and Philosophical Issues in the Conservation of Cultural Heritage*, (1996) 314-318.
[82] William Morris, "Manifesto of the Society for the Protection of Ancient Buildings" (1877), *Historical and Philosophical Issues in the Conservation of Cultural Heritage*, 320.

destruction which a building can suffer."[83] In their eyes, natural damage caused by age was a significant part of the history of that work, while the irreparable damage of restoration was a premeditated violation of the worst order.

Today, though conservators accept change as inevitable, the assessment of what is regarded as damage and whether the damage justifies restoration continue to be issues. Jonathan Ashley-Smith, Head of Conservation at the Victoria and Albert Museum, using insurance vocabulary and "a convention proposed by Canadian conservators (Michalski and Waller)," has built a definition of damage as "a change of state that results in a loss in value [. . .] that decreases use or potential use, or [. . .] that decreases the benefit that society can derive."[84] He cautiously includes in his definition of damage any restoration that "may lead to loss of information or introduction of misleading information."[85] Conservators must therefore weigh the potential damage of restorative intervention against the potential damage of non-intervention conservation.

This was the choice for the Brancacci Chapel, Santa Maria del Carmine, Florence. The accumulated soot from votive lamps, censers, and candles every day of every year for centuries put the chapel in need of art restoration. Clerics there recorded the daily consumption of lamp oil at half a barrel in 1516.[86] Twenty years earlier, a young Michelangelo studied and copied the Biblical frescoes of the master painter, Tommaso Masaccio, when the murals were less than a century old. Five centuries later, cleaning away the accumulated soot and potentially damaging mold from these master works also took the foliage from the shrubbery in *The Tribute Money* fresco and the loin leaves from *Adam and Eve: The Expulsion*.[87] Even more disturbing to art connoisseurs than the revelation of Adam's genitalia[88], was the visible colour difference in the "giornato" [89] in which

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[83] John Ruskin, "The Lamp of Memory, II" (1849), *Historical and Philosophical Issues in the Conservation of Cultural Heritage* (1996) 322.
[84] Jonathan Ashley-Smith, "Definitions of Damage," *Annual Meeting of the Association of Art Historians*, (London, 1995) 5. 25 Jan. 2005 < http://palimpsest.stanford.edu/byauth/ashley-smith/damage.html>.
[85] Ashley-Smith 2.
[86] Fulford 1.
[87] Beck 34-41.
[88] The genitalia got considerable comment in the press at the time (Beck 38).

Adam was painted. The darker blue of the "geornato" around Adam (Figure 2) seems to add a hump to his back and a dark quadrilateral behind his head. Critics not only insisted that the application of restoration techniques needs to be more judiciously applied, but often question the need and justification for restorative intervention at all. Beck questioned whether it is possible to know for certain if the added foliage was not the work of Masaccio himself.[90]

Figure 2: Masaccio's *The Expulsion of Adam and Eve*, before and after cleaning. [91]

The biggest restoration controversy of the last century was the thorough cleaning of the Michelangelo frescos in the Sistine Chapel. Like the Brancacci Chapel, the Sistine Chapel was in need of cleaning. The earlier cleaning of the lower frescoes had made Michelangelo's work look particularly dingy by comparison, despite the array of floodlights, attached to the brackets two thirds of the way up the walls on three sides of the chapel, aimed at the soot coated

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[89] Giornato indicates the area painted on wet plaster in a single day in the fresco process. Many paint pigments are very different wet than dry, and a good match in wet plaster may not match the previous day's background colour when dry. Retouching "a secco" over the seams between dry "geornati" was a common practice to mask such discrepancies. Cleaning down to the plaster, however, removes all such retouches made by the original artist as well as any later additions, such as the leaves.

[90] Beck 39.

[91] Christosrex, <http://www.christusrex.org/www2/art/images/masacc06.jpg>.

ceiling frescoes. The ceiling had survived centuries of plaster cracking tremors, water damage, accumulated smoke and grime, including the 1978 papal conclave in which a stuffed chimney forced the signal smoke from the electoral ballots to fill the chapel, nearly suffocating cardinals and coating every surface with soot.[92] Concerned that flaking varnishes from restorative interventions in previous centuries was threatening to pull away bits of Michelangelo's painting, the Vatican began the cleaning of the ceiling in 1980.[93]

Horrified critics, Columbia University's James Beck in particular, voiced outrage. They contended that the gray modeling of shadows and the application of resins were made by Michelangelo himself.[94] Beck seized on inconsistencies in the Vatican reports on what solvents were being used, whether all, part or any of the ceiling was being coated with a protective resin which would yellow in time, and whether there was any evidence of any green or blue pigments added "a secco."[95] Beck implies some doubt in the Vatican claim that Michelangelo did not employ any such "a secco" additions on the ceiling or that if he did they were long-since removed by earlier cleanings.[96] His case for Michelangelo retouching the ceiling was supported by the extant additions of gold leaf on the medallions and on the brackets flanking the prophets and sibyls. On the other hand the carefully documented analysis of the layers of soot, glue, soot, glue, and soot witness to repeated coatings by others over time.[97]

The *Last Judgment* wall presented additional problems because it was a single image rather than partitioned sections like the ceiling, also because it had been extensively retouched repeatedly over the centuries, including the "refrescoing" of two saints, and because of physical and mechanical damage from direct human contact in the lower portions. Since some of the later retouches were the result of documented papal directives, they had to be retained, and now appear

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[92] Ross King, *Michelangelo and the Pope's Ceiling*, (London: Pimlico, 2003) 293.
[93] Fabrizio Mancinelli, "Michelangelo's Frescoes in the Sistine Chapel," *The Art of the Conservator*, ed. Andrew Oddy, (London: British Museum Press, 1992) 91.
[94] Beck 65.
[95] Ultramarine blue, made from ground lapis lazuli from Afghanistan, was very expensive and usually used only on dry fresco (a secco) because it reacted chemically to the lime and lost its brilliance when painted into fresh (a fresco) plaster.
[96] Beck 72.

as very dark gray or brown swaths of cloth over strategic anatomical areas on some figures. Less well-documented additions were cleaned away. On the wall, painted more than twenty years after the ceiling, Michelangelo had used the expensive ultramarine blue extensively both in the fresco and as "a secco" retouches to the ample sky and Mary's robe. Time and the initial chemical reaction to the lime has faded much of the fresco blue to cool gray, and most of the "a secco" blue was damaged by being "cleaned" at various times either by wine turning to vinegar which corroded it or by lye which removed it altogether.[98]

Figure 3: Michelangelo's *Creation of Sun & Moon*, Sistine Ceiling, before and after cleaning.[99]

A careful comparison of the reproductions published before the cleaning[100] with the published results after the cleaning[101] reveals not only brighter colours, but clearer details, cleaner line, smoother textures, diminished intrusions of cracks in the plaster, and the elimination of uneven application of darkened varnishes (Figures 3 and 4). Many shadows are less dominant but are not gone, and though what remains *may* be marginally brighter or less modeled than Michelangelo intended, the incomparable work of the master can now be seen in

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[97] Mancinelli 92-98.
[98] Loren Partridge, Fabrizio Mancinelli, and Gianluigi Colalucci, *Michelangelo, The Last Judgment, A Glorious Restoration* (New York: Harry N. Abrams Inc., 1997) 180-185.
[99] Christusrex, <http://www.christusrex.org/www1/sistine/1-Genesis.html>.
[100] John Canaday, *Masterpieces by Michelangelo* (New York Crown Publishing Inc., 1979).
[101] Robin Richmond, *Michelangelo and the Creation of the Sistine Chapel* (New York: Crescent Books, 1992) and Partridge, Mancinelli, and Colalucci (1997).

natural daylight, rather than the heavily-lit, nearly monochrome of the tarnished ceiling the author saw in 1980. These results have not satisfied the critics who find the cheerful colours incompatible with their portrait of the brooding, tormented sculptor the pope coerced into painting them.[102]

Figure 4: Michelangelo's head of Eve detail from *The Fall and Expulsion*, Sistine Ceiling, before (with uneven glue strokes) and after cleaning .[103]

The cleaning was a milestone in modern science applied to art. "The restorers did everything they could to surround their work with [. . .] academic legitimacy" including public discussion and an international conference half way through the process, debating whether to continue, though by then it was a moot point.[104] The contrast was too great, and they couldn't put the shadows and soot back. Computers were used to "scientifically" justify the extent of restoration necessary by "infrared telethermos-reflectographic examination."[105] The restoration project made use of computers both as a guide to and as a meticulous record of the process. Installed "20 meters above the ground on the main scaffold," computers allowed conservators to instantly access a database

[102] Richmond 110.
[103] Richmond 106.
[104] Fulford 2.
[105] Fulford 1.

and a map of "every curve and crack in the ceiling down to the last millimetre."[106] Comprehensive environmental controls were put in place to prevent any future water leakage, maintain constant humidity and temperature, filter air-born pollutants, and limit the dust carried in by visitors. The complete restoration took over 13 years: a full decade on the ceiling and lunettes, compared to less than five years spent painting it by Michelangelo; but learning from that experience, only four years on the *Last Judgment*, compared to Michelangelo's six years.

c. Conservation Technology

Technology is changing the face of conservation. Even satellite science has made a contribution to art restoration. In June 2004, NorTech gave their *Jumpstart Innovation Award* to NASA researchers, Bruce Banks and Sharon Miller, for their atomic oxygen restoration system, which uses the discovery of the initially troublesome property of atomic oxygen to remove any organic (carbon-based) substance from low orbit satellites. NASA's bane has proven to be the conservator's boon. It works wonders with soot-damaged paintings because it is nonabrasive and completely non-corrosive with inorganic paint pigments. Ideal for lifting smoke stains after fires, the technique was even used to remove an affectionate lipstick smudge from an Andy Warhol painting.[107] If only the Sistine Chapel conservators had had this technique to remove the layers of animal glue and soot from the ceiling without touching any of the ultramarine over-paint!

One of the most frequent criticisms of conservation is the reliance on technical savvy as a replacement for, rather than as a complement to, vigorous understanding of artistic intent and methods.[108] Conservators employ laser surgery and calcium-fixing bacteria inoculation on sculptures and architecture, and paintings are studied with electron beam probes, DNA analysis, gas-

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[106] Edward Willett, *Art Restoration*, (Copyright 1998, posted 3 April 2001) 2 Feb. 2005 <http://www.edwardwillett.com/Columns/artrestoration.htm>.

[107] Bruce Banks, *Destructive Power of Atomic Oxygen Used to Restore Artwork*, (NASA Glenn Research Centre, 4 January 2005) 25 January 2005 <http://www.nasa.gov/vision/earth/everydaylife/AtomicOxRestoration.html>

chromatography mass-spectrometry, and infrared reflectography. Ultraviolet light allows the conservator to visually differentiate between old paint, newer corrections, restorations, and damage. At the Getty Museum in Los Angeles and Harvard's Fogg Art Museum, these ultraviolet and infrared images are fed directly into computers, where they are processed, compared, and analyzed using Adobe Photoshop.[109] Yet not every conservator either has access to these tools or takes full advantage of them. Even with sophisticated diagnostic technology available there are still conservators who, in the view of Maurizio Seracini, head of Editech, a Florentine conservation company, "are like doctors who prescribe medicine without knowing the detailed anatomy of their patients, let alone the underlying basis of the disease."[110] Part of the controversy rises from the technical revolution. In the past restoration was the work of an artist. The most dramatic recent shift has been toward technology and away from art history and practice. As the conservator's profession has become increasingly dependent on cutting-edge technology and computers, so has their vocabulary become increasingly filled with technical and scientific jargon, often considered to be "unsuited to the humanities."[111] This creates the need for staff who can speak in both the humanistic and the scientific cultures which such activity spans.

Canada, however, is a leader in the science of art conservation. The National Research Council of Canada is marketing their 3-D high-resolution colour scanner to European museums.[112] The Conservation Information Network is the collaboration of the Canadian Conservation Institute, The Canadian Heritage Information Network, the Getty Conservation Institute, the International Centre for the Study of Preservation and Restoration of Cultural Property, The International Council of Monuments and Sites, and the Smithsonian

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[108] "Art restoration: Two cultures united," *The Economist* (Liverpool, London, New York and Paris, 7 November 2002) 25 January 2005 <http://www.economist.com/science/displaystory.cfm?story_id=1429361> 1.
[109] Amanda Castleman, "Digital Imaging: The Fine Art of Restoration," *Wired*, Sep. 2003, 25 Jan. 2005 <http://www.wired.com/wired/archive/9.03/mustread_pr.html>.
[110] "Art restoration: Two cultures united" 2.
[111] Ward 62.
[112] "Canadian 3-D scanning technology acquired by top European Museums," *CBC News*, e-mail to the author, 6 Oct. 2006.

Institution.[113] At the Canadian Conservation Institute in Ottawa, infrared spectroscopy is one of the tools used to accurately analyze the chemical makeup of varnish and lacquer on art to determine which solvents to use to remove it without any damage to the painting. Computers are also used to overlay infrared reflectoscopy images of a painting with X-ray images, making it easy to analyze any retouches or layering in the work.[114]

The potential of digital restoration or reconstruction of art is only beginning to be exploited. Restorers at the University of Florence used digital restoration as a preview to actual restoration work on the " Uffizi Strategic Project " in order to eliminate errors, explore possible restorative avenues, and finally as a guide to actual restoration.[115] Elizabeth Hendrix of the Metropolitan Museum of Art, on the other hand, uses computer photographic enhancement as an analysis tool, but only occasionally as a virtual-reconstruction tool. She prefers the more focused examination and careful "looking" she feels she gets from the process of creating her own reconstructions in meticulous pastel drawings.[116]

John Larson, head of statue conservation at the Merseyside Gallery in Liverpool, has pioneered a technique for "virtually" replicating sculpture. Using a scanner similar to those used in the supermarket checkout stations, he records the three-dimensional data of the object's surface. A computer-modeling program reconstructs the object on screen based on the scanned data, giving the cyber model the simulation of the solid material properties of the original, and allowing the viewer to virtually "touch," through the use of a feedback joystick that is used to interface with computer games. The advantage of virtual sculptures is that they not only form a digital record of the artwork far more comprehensively than any photograph, but can also transmit the image via the Internet to a wide audience, including even the blind via "virtual touch" feedback, while safeguarding the often-fragile original. Larson's original idea

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[113] Ward 62-63.
[114] Willett posting.
[115] *Art-works Digital Restoration* (Laboratorio Comunicazioni & Immagini, Universita di Firenze, November 1999) 25 January 2005 <http://lci.det.unifi.it/Projects/Art/>.
[116] Elizabeth Hendrix, "Painted Ladies of the Early Bronze Age," *The Metropolitan Museum of Art Bulletin*, Winter 1997/98, 4 - 15.

was to replace outdoor sculptures being eroded with expendable replicas, without the risk of possibly damaging the original through the use of moulds. Reversing the data collection process, "Larson has fed his scans of a Roman relief that is slowly disintegrating in a nearby stately home into a computer-controlled machining system designed to make precision tools," resulting in an exact physical replica, especially convincing when using the same kind of stone.[117] The University of Alberta, Academic Information and Communication Technologies, recently acquired a high-resolution 3D colour printer from Z Corporation that binds layers of plaster dust with inkjet heads to build actual three-dimensional objects from virtual-modeling design software or to replicate objects recorded by three-dimensional scans.[118] Such replicas could substitute for irreplaceable objects in such settings as historic homes where display cases for valuables detract from the period setting.

The conservation of original photographs and artwork is a standard practice, but there are display situations where the historical message or visual content takes precedence over the potentially distracting physical condition of the images. Computer researchers have developed a program for the restoration of cracks, tears or other narrow gaps in any digital images, such as old photographs or the digital photos of cracked paintings or murals, broken pottery or damaged sculpture. Researchers like computer engineer Guillermo Sapiro of the University of Minnesota at Minneapolis-St. Paul, Vicent Caselles, and Marcelo Bertalmio of the University of Pompeu-Fabra in Barcelona, have been working on "automated image inpainting." They have developed computer algorithms that imitate art restoration techniques the way optical character recognition software imitates reading. Digital inpainting of still images is considerably more difficult than motion picture restoration because there are no adjacent frames from which to copy image information.[119] It requires careful attention from the

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[117] "Art restoration: Two cultures united," 5.
[118] "3D Printer," *Academic ITC*, University of Alberta, 28 Sep. 2006, 30 Oct. 2006 <http://www.ualberta.ca/CNS/3DPRINTER/#35>.
[119] Ivars Peterson, "Filling In Blanks: Automating the restoration of a picture's missing pieces," *Science News*, 11 May 2002, 161.19, 299. 28 January 2005 <http://www.sciencenews.org/articles/20020511/bob10.asp>.

user just as OCR documents need an editor who adds understanding to the process,[120] but it is a technique that can speed up the digital restoration and photo retouching process remarkably. As with any other conservation technique, this process needs to be accompanied by the meticulous records of digital interventions. Fratelli Alinari proposed a rational set of twenty-seven "policies for the ethical, accurate digital restoration of historical photos." They are divided into nine sections covering the objectives of restoration and preservation, the repair of damage, visual enhancement, modification/cropping, colour alteration, colourisation of monochrome images, historical texture, alteration disclosure documentation, and preservation of original images. Though not binding on anyone, these policies constitute a sound guide for any digital photo archive.[121]

d. Radiant Accessibility

Digital archives not only preserve records for easy access to museum personnel, they also facilitate access to research and visual images, extending the affordance of appreciation to a much larger audience than any museum display. Responding to the growing demand for digital images in art and humanities research, Harvard University Art Museums hosted a joint conference of the National Science Foundation and the Andrew W. Mellon Foundation in 2001. Representatives from more than two dozen top American universities and technical institutions met to discuss "several areas of computing and the humanities,"[122] specifically, digital imagery for art, art history, and archaeology. They recognised that recent advances in computing "have blurred the boundaries between traditional disciplinary lines" of science and engineering and those of arts and humanities. The focus of the discussions was "the retrieval of images based on visual content and issues related to the creation and

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[120] Optical Character Readers make close matches to programmed type but do not read words.
[121] Fratelli Alinari, *Model Ethics Guidelines For The Use Of Digital Photo Restoration, Repair and Reconstruction Techniques For Archival and Preservation Purposes* (DigitalCustom-Alinari, 1 March 2003) 8 Jan. 2005 <http://www.digitalcustom.com/howto/restorationguidelines.asp>.

maintenance of high-resolution two- and three-dimensional digital representations of art objects."[123] Although there is common interest in related research, the motivation, research style and background differences between sciences and arts have sometimes precluded many collaborative efforts.[124] The participants of the brainstorming workshops saw the need for more interdisciplinary and cross-disciplinary education from the beginning and more funding of project collaborations on the graduate level.[125]

The delegates agreed that students and researchers of art and architectural history, conservation, and archaeology essentially need lots of images linked to corresponding textual, visual, audio, and even tactile metadata. This means the creation of "large archives of high quality digital images of art," including normal views, difficult or impossible views and constructed digital images and diagrams.[126] Though firsthand experience is important in high-level research, the delegates recognised that the largest body of research being done in universities today is done through the study of quality photographs. So much art has never been photographed digitally, and three-dimensional sculpture, architecture, and other objects are represented in only selective views, which are not necessarily the most informative for academic purposes. The potential for video clips, multi-dimensional, and rotating views, virtual tours, 3D animations, virtual reconstructions, time-lapse comparisons, different lighting comparisons, detail zooms, and wide orientation views all need to be exploited digitally and made available.[127] These new images as well as existing photograph and slide collections need to be digitized, systematically tagged, and encoded with metadata for improved search capability,[128] and displayed on monitors of the size, resolution, and colour accuracy necessary for serious research.[129] The

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[122] Kevin Kiernan, Charles Rhyne, and Ron Spronk, *Digital Imagery for Works of Art* (Cambridge: Harvard University Art Museums, 19-20 November 2001) 1 February 2005 <http://www.dli2.nsf.gov/mellon/report.html>, 1.
[123] Kiernan 2.
[124] Kiernan 4.
[125] Keirnan 5.
[126] Kiernan 6.
[127] Kiernan 8.
[128] Kiernan 10.
[129] Kiernan 11.

delegates' lists of recommendations can be grouped into three categories: one, hardware and software development, emphasizing affordable higher-resolution colour-accurate monitors and database retrieval development; two, digital visual data and documentation collection; and three, changes to university curricula. They recommended not only cross-disciplinary education but also that "colleges and universities should be encouraged to incorporate computer imaging problems in art history and other curricula in the humanities."[130]

Digital image creation and manipulation have changed our views and expectations of visual images. The goals, recommendations, and expectations of the photo archive coming out of the Harvard summit of the humanities and technical sciences reflect the changes in social epistemology Deibert documented. These perceived needs of research are also reflected in Lev Manovich's digital "photoGRAPHIC" hybrids. According to his analysis, "Since its beginnings fifty years ago, computerization of photography (and cinematography) has by now completely changed the internal structure of a photographic image."[131] The token representative photograph of the architectural exterior must now be multifaceted, multidimensional, diagrammatic, schematic, include extensive metadata, chronicle changes over time, and include a virtual tour of the interior space. Janson's[132] familiar perspectives of famous works of sculpture must now be seen from every angle and in every light. Paintings once recorded in enhanced gallery light now need to reflect ultraviolet, infrared, and x-ray light, zoom out for the comprehensive view, and in for the detailed, and be diagrammed, catalogued, cross referenced, inventoried, and meta-tagged. Archaeological artifacts need to be seen *in situ* as well as in the laboratory or on display, be contextually integrated into the archaeological site map, the regional sites map, and the chronological and cross-cultural tables. Such images demand to be displayed on huge high-resolution, colour-perfect monitors in university classrooms, libraries, museums, and historic sites, with researchers and visitors interacting, selecting, zooming, and toggling between the images displayed.

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[130] Kiernan 12-15.
[131] Lev Manovich, *Image Future* (April 2004), 15 Nov. 2004 <http://www.manovich.net/> 1-2.

Digital restoration or reconstruction also creates the opportunity for the display of artistic and historical works beyond the capacity of normal gallery exhibits. A virtual stroll through the temple of Ammon at Karnak, including different visual renderings according to the findings of different researchers, could be accessed not only at the visitor's centre in sight of the colossal stones, but in the Egyptian exhibitions of North American museums or art history classrooms. Italian museums have recreated chambers from Etruscan tombs at the expense of the destruction of the tombs. A virtual tour of Etruscan tomb paintings, displaying them both as they are and restored to how they looked when they were first opened, or how they might have looked when they were sealed up anciently, poses no threat to the real tombs. Breathing on the monitor would not compromise the fragile wall surface as the breath of archaeologists, art historians, and tourists has done to the originals. The fingerprints on the monitor could be wiped away without forever removing irreplaceable historical data. The files could be viewed anywhere on the globe with Internet connections, while allowing the works of art "the right to remain in their original abode."[133]

Augmented and virtual realities offer greater access and livelier interaction to ancient history. The Lifeplus project by MiraLab, University of Geneva, has repopulated the ruins of Pompeii with virtual ancient Pompeians. Wearing a sophisticated binocular-earphone headset, visitors saw more than the ruins. Virtual 3D characters, reconstructed from the wall frescoes, went about their daily tasks and talked to tourists in the augmented reality of the excavated streets and houses, using real-time interactive technology.[134] The combination of complex digital-animation images visually added to the actual background of the ruins was a technically sophisticated innovation to restoration and historical interpretation.[135] Carnegie Mellon University, Silicon Graphics, and the

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[132] H.W. Janson, *History of Art, revised 6th edition*, (New Jersey: Prentice-Hall, 2003). This is a standard freshman art history text.

[133] E. Welsh 3.

[134] *Pompeii gets digital make-over* (BBC News, 31 October 2004) 1 November 2006 <http://news.bbc.co.uk/2/hi/technology/3954659.stm>.

[135] George Papagiannakis, et al. Mixing Virtual and Real scenes in the site of ancient Pompeii (Geneva: Miralab, 2004) 1 Nov.2006 <http://www.miralab.unige.ch/papers/322.pdf>.

Archaeological Institute of America took a portion of a digitally reconstructed and repopulated Pompeii on tour almost a decade earlier. The virtual reality of the triangular forum with adjacent palestra, temples, and theatre could be navigated by museum exhibition visitors wearing a bulkier headset than the MiraLab model, but the less-intricate graphics still responded to body and head movements. All files of the Virtual Pompeii Project, including graphic, audio, 3D, and metadata files, are now available via the Internet for the free access and further manipulation of museum staff, artists, educators, or students.[136]

The possibilities of touring augmented or virtual realities are not limited to technology exhibits. In 2003 and 2004 North American museums hosted a spectacular 18-month tour of "nearly 400 artifacts, documents, and works of art on loan from the Vatican, including works by Giotto, Michelangelo, and Bernini." The impressive exhibition, *Saint Peter and the Vatican: The Legacy of the Popes*, displayed the works in an architectural multisensory context, re-creating Vatican floors, walls, doors, and even foundations as display media.[137] Digital technology could have added the Sistine Chapel to the tour. To maintain the larger-than-life impact of the original frescoes, Nippon Television could have projected high-resolution digital Sistine murals onto an IMAX screen.[138] It could be shown in a variety of conditions, morphing slowly before your eyes from the dark, brooding, sculptural forms before the cleaning, through the carefully documented process of the cleaning, while a narrator explains the various techniques and considerations of the restorers. Perhaps other interpretive versions could be compared. Imagine, for example, watching all the cracks fade as the virtual restoration takes us beyond the cleaning to the smooth pre-earthquake vault of the 1512 unveiling.

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[136] Jeffrey Jacobson and Jane Vadnal, *The Virtual Pompeii Project* (Iniversity of Pittsburg, 2005) 1 http://www.planetjeff.net/IndexDownloads/Jacobson2005p.pdf

[137] "Last stop for largest exhibit of Vatican treasures to tour N.A.," *Art Business News* (July 2004), 1 Nov. 2006 <http://www.findarticles.com/p/articles/mi_m0HMU/is_7_31/ai_n6106524>.

[138] Nippon Television still has copyright over all photographic reproductions of the chapel in exchange for financing the mural cleaning during the 1980s and 90s.

Figure 5: Michelangelo's Creation of Adam, Sistine Ceiling, before cleaning (Berti 50), **after cleaning** (Richmond 52-53), **and digitally de-cracked** (Ackroyd).

Likewise, the rich lapis-blue sky behind the clouds and resurrected souls of *The Last Judgment* wall, chemically bleached by centuries of cleanings with vinegar or wine, could be virtually restored to when the scaffolding was removed in 1541. As the image on the screen pulls slowly back from the trumpeter angel group in the centre to the full wall shot, an appropriate sound track might be *"The Trumpet Shall Sound and the Dead Shall Arise"* from Handel's *Messiah*, which may have been inspired by Michelangelo's fresco.[139] Panning the length of the vault from the Noah through creation we might hear the *Kyrie* and *Gloria* from Palestrina's *Missa Papae Marcelli*, which may have been sung there during Michelangelo's lifetime.[140] Touring the lunettes, the prophets and the sibyls, a narrator might summarize the theological intricacies of the religious program behind the image choices,[141] accompanied by a Josquin des Pres *cannon* which could have been sung there while Michelangelo was painting.[142]

Virtual restoration could mean a reduction of heated disputes over whether to restore or not to restore, by providing an alternative vehicle for the expression of the restoration urge, while maintaining minimal intervention. It allows simultaneously for different visual interpretations of any work to be explored, presented, debated, and compared. It presents a digital answer to fundamental conflicts of ideology and interpretation. The greatest benefit in digital restoration and archives of art is its accessibility to the audience of students and researchers of art, architecture, history, archaeology, conservation, and related fields, to whom such work would be of especial interest and value. It might also inspire, educate, and entertain museum visitors.

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[139] George Frederick Handel (1685-1759), was working in Rome from 1705 to 1709, prior to 1741 work on the Messiah. *Handel*, 18 Feb. 2005 <http://w3.rz-berlin.mpg.de/cmp/handel.html>.
[140] Giovanni Pierluigi da Palestrina (1525-1594), was appointed *maestro di cappella* of the Cappella Giulia in Rome by pope Julius III (1551), and also sang in the Cappella Sistina choir during 1555. *Palestrina*, 18 Feb. 2005 <http://w3.rz-berlin.mpg.de/cmp/palestrina.html>.
[141] Edgar Wind, The Religious Symbolism of Michelangelo: The Sistine Ceiling (Oxford: Oxford University Press 2000).
[142] Josquin des Pres (1440-1521), sang and composed in the papal chapel from 1486 to 1495. *Josquin des Pres*, 18 Feb. 2005 <http://www.josquin.com/>.

3. Programming

According to Peter Welsh, the traditional museum formally engaged with internal and external stakeholders primarily as an educational institution, though museum programming is often popularly employed as recreation or entertainment.[143] Welsh applauded recent initiatives by the American Association of Museums to make museums more responsive as learning centres, engaging the public in the "creation of meaning," exploring different learning styles, and diverse paths to presentation materials.[144] Bringing his anthropological agenda into the discussion, he advocated being interpretively "complicitous," forcing decisions upon the audience as they engage with display themes on an aggressively two-way interpretive model.[145] Irrespective of the anthropological potentials proposed by Welsh in his re-configuration, his carefully documented analysis of the shift in museum theory and practice from traditional, celebratory, educational repositories toward more contemporary concepts of collaborative stewardship and learning centers, is integral to an appreciation of the potential impact of digital interaction in arts-museum displays. So long as museum and gallery displays are conceived of as spatially-sequential monologues, the dynamics of value-adding digital interaction have no place. But Welsh's well-documented appraisal of American museological trends, confirmed by the broader socially-focused standards outlined in Hayward's second edition of Alberta's handbook, make computer-facilitated displays a logical vehicle for facilitating more flexible interpretation and exhibition of collections. Though Welsh gave concrete examples from American institutions with each point of his analysis, neither the traditional nor cutting-edge exhibits referenced made specific use of digital interaction as a vehicle. This absence only reinforces the relevance of the present discussion.

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[143] P. Welsh 110-111.
[144] P. Welsh 114.
[145] P. Welsh 121.

a. Public Programs and Access

Recent changes in museological perspectives are reflected most poignantly in the differences between *Handbook 1* and *Handbook 2* in relation to programming. Speaking of the "four fundamental responsibilities of museums," Smith defined collection and preservation as "primary," and placed the research and sharing of "that material heritage with the general public through various interpretive programs" as "secondary."[146] The recurring theme running through Smith's discussions of research, public programming, and exhibitions was "interpretation."[147] The interpretive roll of Smith's museum was the synthesis of direct material evidence with reliable primary and secondary information sources "into a meaningful narrative."[148] The final narrative, whether in book, oral presentation, or exhibition form, presented and interpreted "to the public" the artifact's "significance in terms of its own time and place, and the values of [and to] the present culture."[149]

In marked contrast, Hayward's *Handbook 2* insisted on the maintenance of collections as the "means" toward providing heritage "accessibility" to the public in fulfillment of the public trust.[150] "The role of public programming," by her definition, "is to expand the possibilities for interpreting the museum's collections and provide learning opportunities that are tailored to particular audience needs."[151] She saw the public as "active participants" in a "dialogue" of interpretation, a "communication process" developing meaning, understanding, and appreciation of heritage.[152] Hayward explicitly deemphasized the traditional roles of collecting and preserving in favor of "a new focus on service" with "a higher priority on access."[153] Hayward's running theme of accessibility included not only physical access to buildings, programs, and facilities for visitors of differing ages, gender, ethnicity, family situations, or disabilities, but also

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[146] D. Smith 251.
[147] D. Smith 40, 43, 44, 142, 185, 196, 198, 217, 222, and 237.
[148] D. Smith 196.
[149] D. Smith 198, 222.
[150] Hayward 26, 28.
[151] Hayward 252.
[152] Hayward 253.
[153] Hayward 266.

intellectual access to resources for people of different interests, learning styles, educational background, household incomes, and physical distance.

Some of the impetus for change came from *Challenges and Choices: Federal policy and program proposals for Canadian museums*, the 1988 government policy paper, which defined "museums as custodians, research institutions, educational institutions, and centres of entertainment," and asked for access by "all Canadians" to the collections and educational resources, by "using whatever technologies and programming techniques are available."[154] Despite part of this paper being quoted by Smith, *Handbook 1* mentioned the word "computers" only once in a list of twenty-two possible interpretive techniques.[155] Lip service was given to audience intellectual, cultural, and aesthetic diversity,[156] but the recommended "standard practices" for meeting their diverse needs were variations on the narrative delivery: sequentially-oriented exhibition text panels, books, brochures, self-guided-tour booklets, lectures, and guided tours.[157] Recognizing the proven value inherent in these approaches, Deibert or McGann would nevertheless identify them as products of the book-culture social epistemology. No matter how well prepared, these valuable tools limit the interaction of visitors to either receiving the narrative or figuratively putting the book down and walking away. All significant choices are made and conclusions drawn by the expert authors, lecturers, and guides. Smith recognised the museum as a voluntary leisure activity,[158] but while stressing "free choice" as an essential element of informal learning, offered the visitor only the choice to freely enter or leave.[159] In contrast, digital interactivity as basic as a menu of related information choices, by affording the participant a variety of approaches to the meaning-making process, encourages visitors to pause, evaluate, look at again, and make personal connections with the objects it accompanies. Such interaction would extend the average "35-45 seconds" attention that Smith

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[154] *Challenges and Choices: Federal policy and program proposals for Canadian museums*, (Ottawa: Minister of Supply and Services Canada, 1988, 10) qtd. In D. Smith 217-218.
[155] It comes after slide-tape presentations near the bottom of the list (D. Smith 237).
[156] D. Smith 224, 234.
[157] D. Smith 222.
[158] D. Smith 222.
[159] D. Smith 225.

reports visitors spend on individual displays,[160] and as she suggests, "time and [. . .] freedom to explore are needed for a fully-rewarding visual experience."[161]

Handbook 2 advocated the promotion of "lifelong learning" by capitalizing on people's "natural curiosity" and making the museum an informal centre for learning and exploration.[162] There are few things more intellectually stimulating than feeling you are on the edge of discovery. Hayward suggested, "Rather than distilling facts, issues, and opinions to come up with a seamless narrative, museums can expose visitors to the kinds of dilemmas," contradictions, ambiguities, and discoveries encountered in the research of the experts, by making information resources available and by "sharing the role of 'expert' with community members."[163] Digital information technology was designed to facilitate just such information juxtapositions and alternative threads of connectivity. Hayward's description of the "qualities of informal learning" is a perfect match with the exploration of digital resources where "participation is self-paced, self directed, non-linear, and visually oriented. Visitors can combine objects, text, interactive devices, audiovisual presentations, and other elements of programs and exhibits into meaningful learning experiences."[164]

Though such an informal approach may "appear unstructured," Hayward cautioned that its "effectiveness depends on a framework of educational theory and practice."[165] She therefore provided a review of the theories of "multiple intelligences," learning styles, learning stages, and the learning characteristics of adult, youth, children, and family groups, stressing diversity of options and user choices.[166] Though the learning theory section does not discuss digital application, computers are most effective at simultaneously providing multiple avenues to resources. Rather than a single narrative, alternative menu choices could be designed to utilize different "intelligences" and styles, to appeal to different learning stages, ages, and group characteristics in creating individual

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[160] D, Smith 270.
[161] D. Smith 226.
[162] Hayward 37.
[163] Hayward 37.
[164] Hayward 286.
[165] Hayward 286.
[166] Hayward 287-290.

learning experiences. The creation of effective informal learning resources requires greater planning and preparation than an attractive single-narrative display, and draws more fully on the expertise of curatorial, educational, and design personnel working cooperatively.

In addition to learning theories addressed in *Handbook 2*, the *Theory of Cognitive Dissonance*[167] helps explain how attitudes are determined and values internalized. Underlying the pedagogical assertion that free and multiple choices are a more sound approach to informal learning than a textual, verbal, or visual monologue, the "Free-Choice Paradigm" describes how value is psychologically ascribed to the "chosen alternative" in response to the cognitive dissonance created by multiple choices.[168] This increase in the relative value of chosen over unchosen alternatives, called "spreading of alternatives," begins in the process of making a choice.[169] Subsequent choices in a chain reinforce and strengthen the positive value ascribed. Free choice therefore not only empowers the chooser, but adds value to information, cognitions, artifacts, and the institutions associated therewith. Digital interactivity increases the potential not only of greater engagement with museums, galleries, and historical sites, but psychologically adds value to them in the minds of patrons engaged in multiple free-choice explorations.

b. Exhibits Focus on Visitors

Museological trends regarding exhibits are again evidenced in the contrast between the handbooks. In *Handbook 1* "exhibitions are the primary means by which collections are made accessible to the public."[170] With the focus on the collections, the planning, design, and production of the exhibit were therefore carefully outlined, in order to attract attention to the collection, convey the desired message, and "hold the attention of the visitor long enough to

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[167] Eddie Harmon-Jones and Judson Mills, *Cognitive Dissonance: Progress on a Pivotal Theory in Social Psychology*, Washington, American Psychological Association, 2006, Sample chapter, 25 September 2006, <http://www.apa.org/books/4318830s.html> 1.
[168] Harmon-Jones 3.
[169] Harmon-Jones 12.
[170] D. Smith 254.

communicate at least part of the message."[171] Attention was given to the consistency of colours, text, and graphic styles in the design of promotional and orientation materials, exhibition labels, and didactic panels which convey the narrative,[172] and to the control of light levels and the elimination of ultraviolet radiation damage to exhibited objects of colour-sensitive materials.[173]

While recognizing exhibitions as "the most public face of museum operations," *Handbook* 2 placed "a new focus on visitors" as "central to the overall process" of exhibit planning.[174] This "new focus" informed every subsequent and even more thorough discussion of exhibit planning, design, construction, safety and security, conservation issues, and both pre- and post-exhibition evaluations.[175] Technologies that were less developed or simply not available at the time of the 1988 policy paper[176] became recommended programming techniques in Hayward's standard practices, such as pre-visit orientation information and publicity, not only via the external distribution of flyers or brochures, but through an Internet web site.[177]

Visitor orientation and museum navigation were given more attention in *Handbook* 2. Hayward recommended the onsite physical and conceptual orientation information, and answers to frequently-asked questions, be provided by multi-lingual staff in several different languages common to visitors.[178] However, if the web site included such orientation and answers in a selection of languages, digital monitors could augment the effectiveness of well-trained or even bi-lingual reception staff in responding to visitor needs, both at the reception desk and elsewhere in the museum. Recognizing that all museum visitors do not relate equally well to maps or floor plans, whether wall-mounted

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[171] D. Smith 271.
[172] D. Smith 274.
[173] D. Smith 281.
[174] Hayward 321.
[175] Hayward 328-349.
[176] *Challenges and Choices: Federal policy and program proposals for Canadian museums,* (Ottawa: Minister of Supply and Services Canada, 1988, 10) qtd. Dianne Smith 217-218. The paper asked for the utilization of "whatever technologies" were available to broaden museum access.
[177] Hayward 266.
[178] Hayward 277.

with you-are-here icons or in brochure format, large museums could assist visitor navigation by the regular distribution of orientation monitors offering photographic or virtual 3D guidance to facilities, amenities, collections, displays, or exits.

Edward Tufte designed the then-cutting-edge navigational kiosks for the National Gallery in Washington in 1997. As a graphic-design critic, Tufte looked at some of the poor choices in interface designs common at the time, and not entirely lost yet, and made some design recommendations of things to apply and to avoid.[179] Designed to facilitate easy orientation and navigation, he recommended that the default layout offer as much content choices as possible, rather than layering the content through a series of metaphorical pages with "little bits of data to be unveiled gradually."[180] Tufte disapproved of wasting space and trivializing content with "over-produced styling," and vehemently abjured organizing content into the "tiny irritating steps" of "a tedious decision tree" or according to "the hierarchical structure of the bureaucracy producing the design" but irrelevant to the user interests or needs.[181]

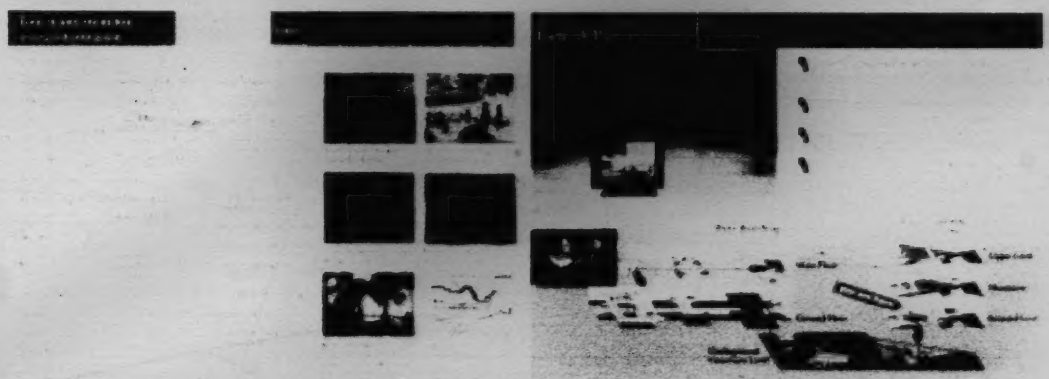

Figure 6: Opening Panel (left) and Flemish Painting (right), Navigation Kiosk, National Gallery Washington.[182]

Tufte offered two examples of his own navigational "confections" for a museum. On the left of Figure 6, his opening panel was both logo-free, corporate

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[179] Edward Tufte, *Visual Explanations: Images and Quantities, Evidence and Narrative.* Cheshire, Connecticut: Graphic Press, 1997: 146-150.
[180] Tufte 146.
[181] Tufte 148.
[182] Tufte 146, 147.

identity being redundant in the foyer of the institution; and icon-free, because "in an architecture of content, the *information becomes the interface*."[183] The use of space was only 10% administrative, introducing touch-screen use and six alternative languages; and 90% content, offering 45 immediate options to touch. At the right of Figure 11 is the guide panel seen in response to touching the words "Flemish Painting" on the opening panel menu. Below the written description of the navigation route, appeared a 3D map with you-are-here arrow, directional foot-prints numbered to match the description, a red-line path to the Flemish galleries, and a sample painting. A live-video image of the monitor, anyone standing at the monitor, and a footprint and red arrow indicating the stairs as the first step in the route, helped the visitor identify with and feel part of the museum.[184] The visitor could touch the upper bar to either return to the opening menu or to print the image, turn and smile at the camera, and receive a personalized, souvenir, high-resolution printed guide to the Flemish paintings. Unfortunately, a decade ago the museum was not yet prepared to offer digital guidance through the Flemish paintings.

Taking this idea a step further, Roderick Davies advocated audience needs over curator narrative and suggested a "browsing" approach to museum navigation.[185] "Putting the needs of the audiences first,"[186] according to Davies, takes designers away from the linear, sequential, goal-oriented approach to display, and accommodates a "browsing" approach to exhibit content, where navigation is the crucial facilitation factor.[187] He referred to several British museum usability studies,[188] and suggested not only an online comprehensive orientation web site but onsite computer terminals as a "guide-point system,"[189] providing both hyperlinked contextual information and navigational guides to locations of related objects, for patrons and museum personnel alike. Davies

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[183] Tufte 146, Italics in original.
[184] Tufte 148.
[185] Roderick Davies, "Overcoming Barriers to Visiting: Raising Awareness Of, and Providing Orientation To, A Museum and its Collections Through New Technologies," *Museum Management and Curatorship* 19 (2001): 283-295.
[186] Davies 283.
[187] Davies 285.
[188] Davies 284.

developed a duel platform program, with visual symbols as orientation icons, for use on both the Internet and a computer network system within the Birmingham Museum and Art Gallery.[190] Davies' system provided pre-visit orientation and visit incentive to the web browsers, consistent with the gallery orientation and navigation for onsite visitors, while simultaneously meeting governmental increased-access goals.[191]

Preserving the past is such a fundamental part of the institutional identity of many arts museums that it can inadvertently manifest itself in the very manner in which exhibitions are designed. Social epistemology, defined as "the web-of-beliefs into which a people are acculturated and through which they perceive the world around them,"[192] is evidenced more in how one thinks than in what one thinks about, or in the limitations such a belief-web imposes. Exhibition designers acculturated to the book communications environment, which has historically dominated museology, naturally perceive their work within the metaphor of the linear exhibition narrative in which "themes and sub-themes [are] delineated,"[193] and "the storyline [. . .] is mapped on to the available space."[194] In an ironic metaphor inversion from the "digital" communications environment, Davies suggested overlaying the "browsing" navigation system of the "virtual museum metaphor" onto the physical museum space.[195] While the physical layout of objects in a given display may still be organized according to a logical narrative metaphor, a museum visitor could browse a unique path through other related objects or displays in the museum by using suggestions and directional guidance from the digital information incorporated into the display. Reconciliation of these discrepant metaphors is possible within

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[189] Davies 286.
[190] Davies 288-293.
[191] Davies 294.
[192] Deibert 75.
[193] D. Smith 273.
[194] D. Smith 272.
[195] Davies 288.

Hayward's "new focus on visitors," by providing both exhibition approaches to meet the different needs of visitors with different social epistemologies.[196]

Speaking at the Communications and Technology Research Symposium 2006, Dr. Terry Anderson spoke of the educational tensions resulting from the differences in the way students, whom he labeled "digital natives," perceive and use computers compared to their teachers, who are usually "digital immigrants."[197] Digital immigrants know what a slide-rule is for, and remember workplaces, classrooms, and homes without computers. For them computers are tools for specific tasks. Digital natives were born after the marketing of personal computers began to mediate everyday functions through word processing, digital graphic design, information retrieval, e-mail, and entertainment, with online music, television, and movies. For them, computers are also the social centres of their daily life, flooding cyberspace with digital voice recordings, photos, video clips, personal web-sites, blogs, chat-rooms, instant-messaging exchanges, and games played against other digital natives from anywhere on the World Wide Web. They are more acculturated to Davies' browsing navigation than to the linear narrative presentation.

For many digital immigrants, however, there remains a visual dissonance between digital displays and the art and artifacts of museum collections. To them, computers may not only be seen as foreign to the narrative exhibition style, they may also often be seen as a counterfeit of what they regard as the real exhibit, distracting from or competing with art or artifacts. To the suggestion of using computers as a gallery display medium, a congenial docent in the Portland Art Museum resource room responded, "I can't imagine any curator would go for that!" When asked why she thought that would be, she answered, "Because

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[196] Another example emphasizing the discrepancy between "book" and "digital" epistemologies, Jerome McGann refers to the valuable learning experience of the failure to publish *The Rosetti Archive* within the institutionalized constraints of traditional academic book publishing, in contrast to ultimate independent online success (*Radiant Textuality* 26).
[197] Terry Anderson, *Connected Learning- How Networked Technologies Change the Way We Learn*, Keynote speech, Communications and Technology Research Symposium, University of Alberta, Edmonton, 19 May 2006.

museums are all about art, not about reproductions or copies of art."[198] This binary view seems to be emphatically expressed in Walter Benjamin's most influential opus, *The Work of Art in the Age of Mechanical Reproduction* (1935-36), in which his politically charged argument can be interpreted as an indictment against photography, printing, and motion pictures for stripping the aesthetic and mystic aura from art and live theatre by mass reproduction and dissemination, and for desensitizing humanity by trivializing true art and artistry through the familiarity of its counterfeit.[199] Despite the subsequent recognition of photography and motion pictures as art forms in their own right, worthy of galleries or entire museums specifically dedicated to their preservations and exhibition,[200] the arbitrary assigning of artistic or cultural value based on inconsistently applied definitions of real or original is very persistent.

There are no simple answers to the question of what is art, what is original, or what is real. London's National Gallery does not hide its real oil painting of Leonardo's *Virgin of the Rocks* because it is not the original painting now in the Louvre, and would never refer to their treasure as a mere replacement copy. Both the Minneapolis Institute of Art and the Museo Nazionale, Naples, prize their Roman marble copies of the lost Greek bronze *Doryphoros* even though neither is the real work of Polykleitos. The Art Gallery of Alberta exhibition, *Northern Passage*, placed drawings, oil sketches, photographs, and "archival material from the 1927 and 1930 voyages of the Beothic,"[201] on the same gallery walls with the real oil-paintings of two of Canada's Original Group of Seven, the juxtapositions of which blurred any museological definitions of real or original. Which are more real, the paintings or the photograph references from which

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[198] She also suggested, "I think it would be fine to have computers in an adjacent room to the exhibit, just not in the room with the original art." After some further explanation she thoughtfully reconsidered: "They might go for that." Interviewed 9 May 2006, she granted permission to use the quote but preferred to remain anonymous.

[199] Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction." (Quoted from Paul Valery. *La Conquete de l'Ubiquite*. Trans. Ralph Manheim. New York: Pantheon, 1964).

[200] A quick Google search on 6 September 2006 of "Cinema Museum" recorded over 14 million hits including cinema museums in London, Chicago, Turin, Moscow, and Thessaloniki among the first ten. A similar "photography museum" search collected over 28 million hits including museums in Ottawa, New York, Bradford, Riverside, Winchester and Liverpool on the first page.

[201] *Northern Passage: The Arctic Voyages of A.Y. Jackson, Frederick Banting and Lawren S. Harris*, Art Gallery of Alberta, June 9 - September 10, 2006.

they were painted? Which are more original, the drawings and preliminary oil sketches, or the final oil paintings? That exhibit also included a large-screen video monitor set up in the gallery playing historic silent-film footage taken by the artists on their voyage, which had been digitally transferred from the original cellulose to DVD.[202] Is the digital record of the artists experience less real than the cellulose original? Attempts to define the "real" open very complicated philosophical issues beyond the scope of this thesis.[203] Are arts museums only about art and artifacts? Both of the da Vinci paintings, both Roman sculptures, all the *Northern Passage* sketches, paintings, and film, and every other collected work of artists, craftsmen, or technicians are ultimately only samples, evidence, or symbols of the civilization, culture, science, art, values, and reality that museums are in the business of preserving and exhibiting.[204] By "putting the customer first,"[205] *Handbook 2* subordinated the issue of visual competition between objects and digital images to the issue of what will best meet visitors' needs and expectations.

Because these "objects do not speak for themselves,"[206] museum exhibitions mediate the experience of art and artifacts for visitors. Many advocates of the pure experience of art have had extensive education or experience with art, history, or aesthetic appreciation, and significantly underestimate the mediation their own backgrounds bring to their pure experience of art appreciation. The traditional forms of mediation, including orientation material, narrative display design, labels, didactic panels, printed guides, live docents, and sometimes lavishly illustrated exhibition catalogues, can all help visitors relate to and find meaning in the objects. New media simply offer more ways of relating. Like the animated discourse of a living docent or museum guide, the digital texts and images certainly take attention from exhibit objects, but should also redirect the viewer to the art and artifacts by providing contextual significance for the

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[202] Digital Versatile Disc (formerly Digital Video Disc)
[203] For a semiotic discussion of the "real" see Jean Baudrillard's *Simulations*, in which art and reality finally become indistinguishable "simulacra," reflections of each other (44-45).
[204] Hayward 28-29.
[205] Hayward 266.
[206] D. Smith 269.

objects, calling attention to specific aspects of note, and focusing that attention back onto the artifacts in more informed and valuable ways.

Visual dissonance can be diminished when digital graphics are seen in the perspective of media development. Just as museums and their exhibitions are media of art and culture,[207] individual artifacts and works of art within museum collections mediate our heritage, not only by capturing historical moments, but often through graphically reproducing paintings, sculpture, and architecture.[208] In *Remediation: Understanding New Media,* David Bolter and Richard Grusin examined the mediation of older communications media through new media and the relationship of different electronic communications media on each other, hence their new definition to "**remedia**tion."[209] They compared the representation of communication media such as paintings, maps, books, and globes in old Netherlands master paintings to the representation of photographs, paintings, posters, manuscripts, and television clips in digital images seen on the net, and "argue that remediation is a defining characteristic of the new digital media."[210] Just as Deibert placed digital communications technology in the perspective of developments in social epistemology, Bolter and Grusin placed digital graphics in the perspective of the quest for viewer immediacy and medium transparency in the development of Western visual art and technology.[211] With reference to McLuhan's trans-media sequence of content transfer from speech to writing to printing to the telegraph,[212] they placed the discovery and development of linear perspective during the Renaissance, subsequent naturalistic painting, and even trompe l'oeil surrealism, in relation to "the perfection of linear perspective" through the medium of photography,[213]

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[207] Hayward 29.
[208] Examples could be found in other art periods and media, but the Baroque paintings of Jan Bruegal the Elder (1568-1625), Peter Paul Rubens (1577-1640), Jan Vermeer (1632-1675, Jean Antoine Watteau (1684-1721), Giovanni Paolo Pannini (1691-1765), or Johann Zoffany (1733-1810) offer numerous obvious samples (Stephano Zuffi, *Baroque Painting,* Milan: Baron's, 1999).
[209] Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media,* (Cambridge: MIT Press, 2000).
[210] Bolter and Grusin 45.
[211] Bolter and Grusin 21-50.
[212] Bolter and Grusin 45.
[213] Bolter and Grusin 25.

subsequent digital imaging, and virtual reality as the "repurposing" of visual content from one medium to another.[214] They pointed to the replacement of the textual command-line interface by the desktop-metaphor of Macintosh and Windows graphical user interface,[215] as the beginning of the developments in digital graphics and display hardware that have lead "to a new cultural definition of the computer."[216] In this light, Davies virtual-museum metaphor for both screen interface and physical museum navigation is just another "repurposing" of visual and conceptual content. According to Bolter and Grusin, to "define itself in relationship to earlier technologies of representation" is ultimately "all any new technology could do."[217] What makes digital media new is the level of user interaction and control.[218] They conclude that the defining relationships, both of content and meaning between digital and earlier technologies, ensure that "traditional media will continue to exist alongside the new networked forms."[219] The implication for a museum would be the design of exhibitions with traditional art and artifacts alongside touch-screen monitors displaying complementary content.

Complementary content can also be found between *Handbook* 2 and the *Essential Guide to Writing for Interactive Media*.[220] *Handbook* 2 recommended designing exhibits to meet visitor's "information, identity, interaction and entertainment" needs, suggesting "interactive presentation methods which let visitors actively explore ideas," eschewing information overload by "exploring one idea at a time" while "encouraging them to find out more."[221] Bonime and Pohlemann "defined interactivity as the property of any action that responds dynamically to user control."[222] *Handbook* 2 recognised the potential of

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[214] Bolter and Grusin 45.
[215] An innovation of the Xerox PARC (Palo Alto Research Center)
[216] Bolter and Grusin 23.
[217] Bolter and Grusin 28.
[218] Bolter and Grusin 29.
[219] Bolter and Grusin 222.
[220] Andrew Bonime and Ken C. Pohlmann, *Writing for New Media: The Essential Guide to Writing for Interactive Media, CD-ROMs and the Web* (New York, John Wiley & Sons, 1998).
[221] Hayward 321.
[222] Bonime and Pohlemann 16.

computers to tailor information to visitor choices.[223] In a discussion reminiscent of the "Free-Choice Paradigm" in the *Theory of Cognitive Dissonance,* Bonime and Pohlmann asserted that the level of user comprehension and information retention is low for voluntary text, whether hard-copy text panels or digital screen layouts, but rises in direct proportion to the level of interactivity required to obtain it, from low-effort "rollover" information triggered by cursor movement over "hot spots" mapped onto the screen images or text, to the deliberate mouse-clicking or touch-screen-tapping action which psychologically equates with a request for information, to active searches.[224] *Handbook* 2 suggests three significant dividends to the personal choice path to the data, "deeper understanding and greater appreciation [. . .] with a unique sense of intimacy."[225]

Handbook 2, recognizing the advantages to visitors of computer menus offering access both to "more general or more specific data," in the form of written or audio text, computer graphics, simulations, digitized video clips, or any combination,[226] nevertheless offered two cautions. First, a digital solution is not the answer to every need. Interactivity is certainly not limited to digital media, and technology "should not be a crutch."[227] Appropriate and effective designs and applications "of interactivity ultimately stem from the relationship of the media to the content."[228] A visitor to a history museum or historic site "may learn more about grinding grain by using a hand-mill than from playing a computer game."[229]

Second, museum navigation and visitor flow can be impeded by a single visitor monopolizing a computer monitor for an extended period. Handbook 2 suggested limiting the exhibit interaction to "short 'bites' of information," while offering more extensive digital resources on computer stations in an adjacent resource room.[230] Focusing on visitor needs, a wide variety or general, specific,

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[223] Hayward 326.
[224] Bonime and Pohlemann 142-144.
[225] Hayward 367.
[226] Hayward 327.
[227] Bonime and Pohlemann 154.
[228] Bonime and Pohlemann 29.
[229] Hayward 326.
[230] Hayward 327.

contextual, navigational, and alternative data could be immediately available within the display design and architecture of the exhibit, and for those interested in greater depth or who have more time to explore, the repeated references to resource room or web offerings would encourage further learning opportunities.

Experience with interactive exhibits and the research into group dynamics in relation to them has mitigated some of the concerns. "Interactive Exhibits: how visitors respond," a study by Guillermo Fernandez and Montserrat Benlloch at the La Caixa Foundation Science Museum in Barcelona, briefly outlined the changing roll of museums from providing visitors with an observation of exhibits to providing participation in exhibits.[231] Using a combination of quantitative and qualitative research, Fernandez and Benlloch made comparisons between the interactions of singles, adult groups, and groups with children in relation to the duration of visitor interaction and their reading of accompanying text materials.[232] The patterns that immerged indicated that single visitors are the most likely to read all the exhibit materials, yet 25% of them view exhibits without reading or interacting at all. The most common museum visitors are couples or small groups. Groups of adults usually have only one member who interacts directly with the exhibit, while one or more read the panels and watch the interaction with relaxed good humor. Adults in groups with children tend to focus on the children's experience. The children ignore text panels completely and tend to view interactive elements as games. The only competition for interactive opportunities was observed among groups with multiple children who, though they exhibited impatience to begin the engagement, actually spent the least time engaged with them. This study suggests that computer interaction by children would be brief, by adults in a group would be by a single individual who would freely share discoveries with the group, and only of significant duration by visitors on their own. Current large-screen, high-resolution

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[231] Guillermo Fernandez and Montserrat Benlloch, "Interactive Exhibits: how visitors respond," *Museum International*, 52.4 (2000): 53-59.
[232] Fernandez and Benlloch 58-59.

monitors would facilitate the sharing of learning experiences and observations among visitors.

c. Publication and Digital Technology

Handbook 1 stressed the value of the collection, repeatedly labeled the "real thing," as a source of primary research, but also charged museums to publish that research, providing the "intellectual access" complementary to the physical access of exhibits.[233] *Handbook 2* devoted an entire chapter to publication.[234] Hayward recognised the enormous impact of "Information Age" technology on museum publication both in the form of in-house desktop publishing and electronic publishing.[235] Under "Publications Development and Production" she included the design and ongoing development of digital resources for exhibits, resource rooms, and the Internet. In addition to all the design and resource considerations of traditional exhibits, electronic publishing must also consider issues of hardware, software, staff training, and "multiple end products tailored to a variety of audience needs."[236] As an example of multiple ends, Hayward recommends thematic research simultaneously aimed at "interactive programs, catalogues, CD-ROMs, searchable databases, videotapes, print publications, teachers' kits, games, and other product lines,"[237] or the production of digital video for use in exhibits, on web sites, or potentially as staff-training, promotional, and souvenir CD-ROMs and DVDs.[238]

Software issues come down to flexibility and longevity. Museum staff have sometimes been unimpressed by interactive or archival systems designed specifically for them at great expense, but subsequently impossible to update in-house and prohibitively expensive to have updated, or incompatible with other current software applications or new hardware. Hayward recommends avoiding closed or proprietary systems.[239] The World Wide Web chose Hypertext Markup

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[233] D. Smith 185.
[234] Hayward 358-371.
[235] Hayward 359.
[236] Hayward 365.
[237] Hayward 366.
[238] Hayward 365.
[239] Hayward 366.

Language (HTML) as its data code because of the ease with which it accesses images, simulating the "eye-organized environment we are so used to."[240] There are many software packages commercially available for the design and alteration of HTML resources, including those bundled in software suites with leading graphic editing and animation software.[241] HTML can be as effective, flexible, and dynamic as the program code for the internal data network, or intranet, accessed from gallery or resource room computers, as for online Internet publication. Cascading Style Sheets also allow the users to select from a menu of choices the interface appearance with which they are most comfortable.

The most significant hardware issues are transparency, or the need to reduce visual dissonance, and reliability. The computer industry is continuing to make advances in more robust and dependable CPUs (central processing unit), larger memory capacity, faster processing and responses, and larger monitors with higher-resolution. By eliminating the keyboard, mouse or ball, touch screen monitors reduce visual dissonance in gallery settings, but would limit user options in resource rooms. Even in that setting visual dissonance can be reduced by the design consistency of the display interface. Initial installation may be a significant investment, but subsequent digital updates to exhibit resources can be faster and much less expensive than rebuilding displays to update or give a facelift to permanent exhibits.

A more substantial investment must be made in human resources.[242] The design and maintenance of effective digital resources will require the training or hiring of designers and technicians as part of the exhibit team.[243] Hayward also suggested partnerships between museums, and between museums and educational institutions as mutually beneficial opportunities to share technical expertise and the costs of digital development, testing, and maintenance.[244]

The World Wide Web is the ultimate expression of electronic publication. An Internet website can not only give multi-lingual promotional and orientation

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[240] McGann 88.
[241] Macromedia Studio includes Dreamweaver and the Adobe Creative Suite includes GoLive.
[242] Hayward 366.
[243] Hayward 328.
[244] Hayward 368.

information, it also provides "unprecedented opportunities to explore new content, features, and services."[245] *Handbook* 2 outlines a number of advantages to virtual exhibits including unlimited space for images and information beyond the limitations of physical galleries; greater public access to research papers, historical texts, archival images, audio recordings, and video clips; omnipresent user convenience and flexibility through thematic information hierarchies, user-friendly searchable databases, and hyperlinks; and communications exchange through visitor-feedback questionnaires. Hayward pointed out that high-resolution colour monitors have another advantage over any poster, art book, or exhibit catalogue, in that the luminosity of digital monitors have a wider colour palette and value range than the finest print-media reproductions.[246]

Web publication raises a number of copyright issues. Unlike the United States, Canada has no specific copyright legislation for digital media,[247] but treats the copying of intellectual property in a digital medium as it would in print. *Handbook* 2 defines intellectual property, sub-categories of protected materials, and copyright limitations.[248] Because ownership of the work does not automatically bestow copyright, older works in a museum's collection may be in the public domain, some materials may be copyrighted to the museum, and others to the work's creator, without whose permission Internet publication would be a copyright violation. Hayward recommends prominently displaying "copyright or credit notice" on all web resources and keeping "the resolution of the [web] images low enough" to discourage unauthorized commercial reproduction.[249] Portable Document Format (PDF) does not prevent the printing

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[245] Hayward 367.
[246] Hayward 368.
[247] "Canada has no equivalent piece of legislation to the DMCA [Digital Millennium Copyright Act], and the types of provisions covered by the DMCA do not exist under Canadian copyright law. The Canadian copyright law is being revised on a piecemeal basis, and circumvention of technological measures as well as tampering with copyright management information are being examined as part of the revision process." (Canadian Heritage Information Network, *A Canadian Museum's Guide to Developing a Licensing Strategy, Chapter 3 — Speaking the Language*, Online posting 16 June 2006, 18 Dec. 2006 <http://www.chin.gc.ca/English/Intellectual_Property/Guide_Developing/ch3_speak_language.html>).
[248] Hayward 370.
[249] Hayward 370-371.

of copies of research documents, but makes the plagiarizing or repurposing of online research more difficult.

The same restrictions that apply to publication on the World Wide Web, do not necessarily apply to images or data on the museum's gallery and resource-room intranet. Under the provision of "Fair Dealing," Canadian copyright law makes specific exemptions for libraries, archives, and museums both for the "Management and maintenance of collections 30.1," and for "Research and private study 30.2," providing there is no financial profits from such copies.[250] Therefore the viewing of high-resolution digital copies of any work in a museum's permanent collection in the context of an exhibit or resource room of that museum is not an infringement of copyright. Making copies available to patrons of other institutions, however, "must not be in digital form."[251] Therefore, only public domain or images for which the museum has copyright may be placed on the external web site.

The Rossetti Archive set new precedence in the electronic publication of art and literature in 2000. Writing of that groundbreaking experience, Jerome McGann predicted, "Online publishing, scholarly as well as commercial, is as certain as tomorrow's sunrise."[252] Museums are in excellent positions to take advantage of this powerful tool for increasing intellectual access and better fulfill their public trust.

d. Adding Value through Radiant Contextuality

The very ways we perceive the literary and artistic heritage of civilization have the potential to radiate in new light as the pattern of hyperlinks radiate to new, broader, and deeper associative contexts. Including both literature and art in the redefinition of textuality in *Radiant Textuality*, McGann examined the implications of digital media on our interpretation, appreciation, and understanding of books, literature, and art. Digital media affords users more

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[250] *Canadian Copyright Law: Sections of the Copyright Act of interest to Librarians*, Online posting 15 Nov. 2006, 18 Dec. 2006 <http://www.infocommons.ca/wiki/index.php?title=Canadian_Copyright_Law>.
[251] Canadian Copyright Law, 30.2 (5).
[252] McGann 27.

powerful, more flexible, and more dynamic tools for textual analysis. Links to the Internet could connect the museum visitor to other reliable sources of information or image archives related to, but not contained in, the museum's own collection. A work of art could be compared to other works by that artist in other collections, or to other works of the same type which may have influenced or been influenced by the work on display. Like many library resources, which are not accessible to casual surfers without costly memberships, the museum links could provide access to otherwise restricted resources. A careful selection of hypertext links could be an invaluable resource of reliable web sites or virtual museum collections.

As the keynote address at the University of Alberta School of Library and Information Studies Professional Development Day, 3 February 2006, Catherine De Rosa presented an intriguing statistical report from a 2005 international study on the perceptions of information seekers about the reliability of the sources they use.[253] The most common method of information gathering, 84% and growing, was the on-line search engine.[254] Google constituted 62% of recent searches by those surveyed.[255] Few Google searchers went past the first ten results displayed on the first search-results page. The most common test of reliability, 82%, was whether two of those ten agreed with each other.[256] There was surprisingly low variance in these statistics – 4% between countries, up to 7% between age groups, and only 2% difference between college/university students and total respondents.[257]

This non-critical approach to information gathering makes the role of the links from library and museum web sites all the more important. There needs to be sources that disabuse the public mind on issues of our cultural heritage, to offer an alternative to the often entertaining misinformation and shoddy

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[253] Catherine De Rosa, et al. *Perceptions of Libraries and Information Resources: A Report to the OCLC Membership*. 17 Nov. 2005, 9 Jan. 2007 <http://www.oclc.org/reports/2005perceptions.htm>. Catherine De Rosa is Vice President of Marketing and Library Services, Online Computer Library Centre, Inc. The international study included Australia, Singapore, India, Canada, the United Kingdom, and the United States.

[254] De Rosa 35.

[255] De Rosa 36.

[256] De Rosa 96.

scholarship of pop-culture fictions, random blogs, and dilettante web pages. The reliance on search-engine sources also raises the necessity of designing museum web pages to best meet the criteria of search-relevance algorithms so that reliable information shows up on the first results page of the search engines. John Brink, Curator of Archaeology at the Royal Alberta Museum, has helped make his museum a world information source.

> I get more questions and comments and inquiries about medicine wheels than anything else. [. . .] I get questions from all over the world almost weekly. "What are medicine wheels?" "Where can I see one?" "Can I build one?" "What colours were they?" [. . .] If you Google the term "medicine wheel," we are the number one hit. We're the top guy on the line that comes up, and that's out of tens of thousands, and it's because we have pretty good information on it, and we have a lot of links that pertain to it. [. . .] When people Google medicine wheels, they say, oh – Provincial Museum – so they click on that and it pretty soon takes [them to] "For information, contact Jack Brink," and there's my email! [. . .] I've got some canned answers that you prepare for the stuff that you get all the time.[258]

Recent trends in Humanities Computing are contributing to the digital resources available for museums and museum visitors. As the computer has become an increasingly ubiquitous and culture-altering tool, the human-computer interface has become increasingly visual. Not only has speed and capacity transformed the computer industry, but the third benchmark of progress in the industry is digital visualization, whether in the size and resolution of screens or the visual sophistication of virtual characters and environments in computer games. This visual focus moves beyond mere eye candy or cosmetic appeal as the traditional book-based humanities exploit the strengths of digital manipulation. It is the visual aspects of image-based Humanities Computing and textual analysis which create the most powerful demonstration of the value of the computer as, in the words of University of Maryland professor Matthew Kirschenbaum, "a venue for representation."[259] The essential contribution of text manipulation is to reveal a model or pattern that engenders insight or

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[257] De Rosa 97-98.
[258] John Brink, personal interview, 1 June 2006.
[259] Matthew G. Kirschenbaum, "Editor's Introduction: Image-Based Humanities Computing," *Computers and the Humanities*, Springer Science+Business Media B.V., 36.1 (2002): 4.

enhances meaning.[260] The beauty of the computer is its potential to make that presentation both meaningful and aesthetic. It is also that visual way of organizing and analyzing information that makes the computer a valuable tool for users of museum databases and archival resources, and for the cross-referencing of museum holdings with the on-line digital archives of other museums and universities, such as the Rossetti Archive at the University of Virginia, The Index of Christian Art at Princeton University, or The Jerusalem Index of Jewish Art at The Hebrew University of Jerusalem.

Quality computer graphics are what distinguishes modern humanistic representation from its low-tech antecedents, and Humanities Computing from the limitations of traditional book-based humanities studies. Statistical analysis of text can be, and has been, presented in tables that become increasingly unintelligible as the data becomes more complex.[261] This need not be the only option in a field where graphic manipulation offers more insightful representations than standard statistical software representations, for, as John Bradley and Geoffrey Rockwell have pointed out, it is the graphic visualization of the data that enables the researcher to see not only the structure but the underlying forces.[262] In fact it is the presentation of the analysis in graphic form that, according to Bradley and Rockwell, "liberates the natural intuition" which we share as humans, empowering the researcher to greater insight and understanding. Graphical representations of text thus become more than presentation tools. They become an instrument of research and a means to further analysis.[263] Whether it is the distribution of "scepticism" in Hume's *Dialogues Concerning Natural Religion*, or the pattern of contrasting references to youth and old age in Euripides' plays, the ability to comprehensively grasp, compare, and interpret at a glance is an affordance that neither the text itself nor

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[260] Willard McCarty, "Humanities Computing: Essential Problems, Experimental Practice," *Literary and Linguistic Computing*, 17.1, (2002): 104–106.
[261] Roger D. Peng and Nicolas W. Hengartner, "Quantitative Analysis of Literary Styles," *Statistics Electronic Publications, Statistics Preprints 338*, UCLA (2002), Retrieved 14 March 2005 <http://www.ingentaconnect.com/content/asa/tas/2002/00000056/00000003/art00003>.
[262] John Bradley and Geoffrey Rockwell, "What Scientific Visualization Teaches us about Text Analysis," *ALLC/ACH conference*, (Paris, 1994): 1, accessed 14 March 2005 <http://www.humanities.mcmaster.ca/~grockwel/ictpaper/paris.htm>.

the numeric data table can offer.[264] Text and image have different strengths that can significantly complement each other when skillfully employed.

Digital images are no longer mere supplements to digital text. Technology development is now applied to graphic elements as it was initially to text. The combination of SGML-based[265] image annotation and pattern-matching search technologies, have brought images into the realm of searchable data.[266] The materialist textual analysis theories of D.F. McKenzie and Jerome McGann from the eighties have pointed textual research toward image-based Humanities Computing.[267] J.B. Harley's analysis of cartography[268] clearly manifests the significant textual contributions of layout, illustrations, marginalia, and other extra-linguistic elements of documents, whether cartographic or literary. An increasing variety of visual artifacts such as maps, graphs, woodcuts, engravings, drawings, paintings, illustrations, diagrams, and photographs are now included within the province of textual scholarship.[269] These ideas have heightened our awareness of the value of seeing the actual artifact if only in digital form. The visual digitization of historical material seems to be at the very forefront of current academic and archival attention.[270]

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[263] Bradley and Rockwell 2.
[264] Bradley and Rockwell 5-6.
[265] Standard Generalized Markup Language.
[266] Matthew Kirschenbaum, Johanna Drucker, Jerome McGann, Joseph Viscomi and Worthy Martin, "Refining Our Notions of What (Digital) Images Really Are, Proceedings of panel discussion," *The 1999 joint annual conference of the Association for Computers and the Humanities and the Association for Literary and Linguistic Computing*, University of Virginia, Charlottesville (1999): 2, 14 March 2005 <http://www.iath.virginia.edu/ach-allc.99/proceedings/kirschenbaum.html>.
[267] Kirschenbaum, "Image-Based Humanities Computing," 3.
[268] J. B. Harley, "Deconstructing the Map," *The New Nature of Maps: Essays in the History of Cartography*,. Ed. Paul Laxton. Baltimore: The Johns Hopkins University Press (2001): 149-168.
[269] Kirschenbaum, "Image-Based Humanities Computing," 6.
[270] Elizabeth Sadler, *Digitizing Manitoba's Cultural Heritage*, presentation at the Rutherford Library, U of A, 7 March 2005. Sadler reported on her work digitally photographing 100 000 rare documents, diaries, letters and newspapers for the project, including the XML encoding of text files, OLIVE automated encoding of newspaper files and the MARTINI open-source software developed for their on-line display. Michael Taft, *Digitizing the ethnological and folk culture archive of the Library of Congress*, presentation at the Education Complex, U of A, 17 March 2005. Taft presented the progress of the work underway to digitize 11 000 sound recordings and associated visual material and metadata.

An obvious example of the synthesis of text and digital images is the William Blake Archive, obvious because Blake's original "printed manuscripts" were a deliberate synthesis of images and poetry, to which Blake, himself, attached great significance.[271] Text-only reproductions of Blake's poetry lack not only the full integrity of his work but the full meaning.[272] His combination of print and "illuminated painting" made for unique variations in every copy of his works. The work of Morris Eaves, Robert Essick and Joseph Viscomi on the William Blake Archive has taken both the variations and the visualizations into account. Digitally archived, SGML tagged, descriptively annotated, and searchably orchestrated, the 3000 images of Blake's published works and related materials are available for the comparative scrutiny of scholars.[273] Careful and restrained digital adjustments have compensated for mechanical colour and contrast distortions in the digitizing process, to ensure the closest fidelity to the original work in its current state of preservation. The exceptionally high standards of accuracy of both the digital reproductions and accompanying contextual information has justified their boast of superiority over the finest commercially published printed reproductions of Blake's works.[274]

In contrast to the Blake Archive's resistance to restore or enhance any of the aged, worn or damaged manuscripts, "The Digital Atheneum" project has applied the mandate to use "new techniques for restoring, searching and editing humanities collections" to the surviving manuscripts from the 1731 Cottonian Library fire.[275] One of the original manuscripts which presented the most difficulties contained the life of the fourth century St. Basil the Great by the eleventh century monk, Aelfric. Though the contents are known from a later copy, the original pages have been torn, burned, and rendered illegible in many places, mislabeled, rebound out of order, and dispersed to two different

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[271] Joseph Viscomi, "Digital Facsimiles: Reading the William Blake Archive," *Computers and the Humanities*, 36.1 (2002): 28. The apparent oxymoron, "printed manuscript," was coined by Robert Essick for Blake's technique of printing unique but repeatable original works.
[272] Viscomi 27.
[273] Viscomi 31.
[274] Viscomi 47.
[275] Kevin Kiernan, Brent Seales and James Griffioen, "The Reappearance of St. Basil the Great in British Library MS Cotton Otho B. x," *Computers and the Humanities*, 36.1 (2002): 7.

institutions.[276] Ultraviolet scans and Photoshop manipulations have been able to digitally restore legibility to what remains of the manuscripts and electronically merge the torn fragments.[277] Using the partially restored images, a completely tagged glossary, and the full electronic text, the user is able to trigger from the glossary the tiled windows containing the text and the manuscript image where the word occurs.[278] One of the most valuable lessons of this collaborative effort was the absolute need for long-term stable system administration and technical programming support for humanities projects of this scale and complexity.[279]

With these new original manuscript sources to peruse, the technical support has turned to the development of software to manipulate and study them. The nineties saw the development of Better Access to Manuscripts and Browsing of Images (BAMBI), Image Annotation in Java (Inote) and Multi-Variant Content Editor (MVED) for attaching annotations to text in raster-image formats and comparing variations in batches of text versions.[280] Other tools have been developed combining XML and TEI programming for tight coupling between handwritten images and transcriptions.[281]

The traditional humanist world of arts and letters (heavy on the letters) was enabled and even shaped by the technology of printing. That technology carried concepts of authorship, information hierarchy, finality and permanence that arise from the physical structure of the book. The limits of the technology also excluded sound communication and until the last century only rarely included colour or pictures.[282] The flexibility of hypertext erodes all the limiting structural concepts of the book, which humanists have come to value. In fact the very

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[276] Kiernan, Seales and Griffioen, 8-12. Ironies of the restoration included the pages containing the story of the miraculous obliteration of a text has been unmiraculously obliterated by damage and attempted restoration, and the page where Basil rips up a man's contract with the devil has been ripped in half and mistakenly rebound as pages 6 and 50 of the volume.

[277] Kiernan, Seales and Griffioen, 12-17.

[278] Kiernan, Seales and Griffioen, 22-23.

[279] Kiernan, Seales and Griffioen, 24.

[280] Eric Lecolinet, Laurent Robert and François Role, "Text-image Coupling for Editing Literary Sources," *Computers and the Humanities*, 36.1 (2002): 52.

[281] Lecolinet, Robert and Role, 53-71. XML is eXtensible Markup Language, but TEI may stand for Text Element Identifier or Text Encoding Initiative.

[282] Emanuele Salerno, "How Computers Affected Humanities," *International Journal on Science Communication*, Jekyll.comm 3, (September 2002): 12.

mutability and electronic documents raises new concerns about document authorship[283] and permanence.[284] Yet that same flexibility in electronic documents embrace not only colour images and sound but also animation and full action video images. The digital convergence of all media in cyber culture is so images dominated that Mary Keller, of the Centre for Advanced Research and Technology in the Arts and Humanities at the University of Washington, in her discussion of "The Place of Images in a World of Text," observed "that humanists must soon come to appreciate the place of text in a world of images."[285] New technology is enabling and shaping the humanities in more visual ways.

Humanities Computing is at the very fulcrum of this convergence and reshaping. In an increasingly visual and multi-media environment, it is not just the text-based humanities disciplines like literature or history with which the new technology is merging, but with art and design. Geoffrey Rockwell emphasizes the strong visual design components of Humanities Computing projects. Speaking of the presentation of Humanities Computing research artifacts, he insists, "The visual and interactive design is tied to the rhetorical purpose of the artifact."[286] Visual design and visualization of the representation is the aspect of computing that anchors it to the arts and humanities, not the high speed processing of the mundane and repetitive.

Kim Veltman looked at the rise of new and perpetually mutable media as contemporary art, whose conservation is dependent on the continued development of technology as both the archival and the access medium.[287] To mention only a couple of his examples, web pages and virtual museums, or even cities not only display art and architecture, but are new forms of art in

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[283] Yorick Wilks, "On Ownership of Text," *Computers and the Humanities*, 38.2, (2004): 115–127.
[284] David S. Zeidberg, "The archival view of technology: Resources for the scholar of the future," *Library Trends*, Urbana, 47.4, (Spring 1999): 796–805.
[285] Mary Keeler, "The Place of Images in a World of Text," *Computers and the Humanities*, 36.1, (February 2002): 75.
[286] Geoffrey Rockwell, "Graduate Education in Humanities Computing," *Computers and the Humanities*, 36.1, (February 2002): 244.
[287] Kim H. Veltman, "History of Art About and by Means of Computers," *ARCO 2001 Conference*, Arco Noticias 20, Madrid. (2001): 56-61.

themselves.[288] Hypertextuality opens unending possibilities for expanding the contexts and relationships of not only art and art history, but of our worldview. Technology augments reality, knowledge, and culture in ways that transcend McLuhan's global village in overlapping networks of global villages beyond time or geography.[289] Contemporary studies in Humanities Computing complement the very fundamental aim of museums "in the service of society and of its development, [. . . as it] researches, communicates and exhibits, for purposes of study, education, and enjoyment, material evidence of people and their environment."[290]

E. Smart Arts Communication and Exhibition

The recent changes in museological definitions and issues in relation to changes in available technology will result in the evolution of communication and exhibition practices of arts museums. Philosophically museology has moved from an authoritarian to a responsive identity, from the book to the digital social epistemology, from restoration to nonintervention conservation, from exclusive to radiant public accessibility, from a collection to a visitor focus, and from print to electronic publication, but practice is seldom completely synchronous with philosophy. The museological issues of the preceding section lay the foundation for the further exploration of the smart museum. Part II will discuss international examples of museum smartness, and where Canadians fit in the dynamics. Part III will profile three different Alberta museums, build on the common themes from staff interviews, and make recommendations. Part IV will summarize and conclude the thesis.

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[288] Veltman 57-58.
[289] Veltman 60.
[290] ICOM Definition.

II
THE SMART MUSEUM

Following the suggestions of the *Federal policy and program proposals for Canadian museums*, smart museums are those that utilize "whatever technologies and programming techniques are available"[291] to facilitate those seeking information. Since Vannevar Bush first conceived of his "memex,"[292] a fundamental aim in the development of computer technology has been the acquisition and access of information. Recent advancements in computer-monitor display capabilities afford museum galleries, historic buildings, and interpretive centres the use of wide, flat-screen, high-resolution computers as visitor-interactive display media alongside art and artifacts. There is so much that hypertext metadata, audio-visuals, virtual restoration, and digital animations have to offer historic site and museum facilities, examples of which will be discussed in this chapter. Visitors have responded positively as the immediacy of access to the contextual and in-depth information resources available to virtual patrons on virtual sites is made available to visitors in the presence of the art or artifacts at the actual museum. It is that kind of technology application that makes the museum the entertaining and learning experience that will attract greater audiences in the future.

Though many practical suggestions have been made in the preceding discussion of philosophical issues, the following discussion will focus more on the technological applications than the ideologies of museum practices. Recent international successes in technology usage by museums can help in making sound technology choices closer to home. Statistical trends in Canada with regard to computer use among museum visitors adds perspective to the computer-use choices of Alberta museums.

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[291] D. Smith 218.

[292] Vannevar Bush, "As We May Think," *The Atlantic Monthly*, July 1945, online posting accessed 20 September 2004 <http://www.csi.uottawa.ca.caq/%7Edduchier/misc/vbush/awmt.html>.

A. Some International Perspectives

Computer technology affects cultural heritage institutions throughout the developed and developing countries of the world. Though some of the examples in this section are science museums, their research and success in using technology to better meet visitor needs have influenced subsequent choices and successes of arts museums. The ideas of a Japanese museum designer may have influenced the architectural choices of an Egyptian museum, and the visitor-needs studies of a British science centre have impacted technologically innovative practices in British art and history museums in responding to user information requests and visitor surveys.

As a museum designer, Eiji Mizushima asked "What is an 'intelligent museum'?" and supplied a Japanese perspective in response.[293] Japan is experiencing rapid advances in communications and information technologies with a predicted value shift "from products to knowledge."[294] Mizushima defined the intelligent museum as "one that highlights information and therefore makes structural provisions for information circulation and management."[295] For him, intelligent museum design is fundamental to the architectural conception, rather than a furnishings afterthought. He gave as an example the local area network at the Yokohama Science Centre, where rather than conventional labels on displays, computer monitors dispersed throughout the museum create an interactive system to control and facilitate "information services" for visitors, linking them to "different sources of information available to them in our institution" and to each other.[296] The periodic survey requesting user gender and age group allowed the computer system to tie that demographic to usage analysis data such as duration on the computer, times of high usage, materials accessed, and hyperlink sequences followed, from which information designers could determine areas for improvement. He concluded

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[293] Eiji Mizushima, "What is an 'intelligent museum'? A Japanese view," *Museum International*, 53.4 (2001): 68-70.
[294] Mizushima 68.
[295] Mizushima 68.
[296] Mizushima 69.

that such innovations could constitute a "museum revolution."[297] Though his example was a science museum, Mizushima has also designed a Japanese history museum.[298]

Also focused on building the intelligent museum into the architecture, Yasser Mansour reported on possibly the largest museum project ever –"The Grand Museum of Egypt Project."[299] The 2002 competition attracted over 2000 architectural submissions from over one hundred nations.[300] Scheduled to open in 2009, the museum has already begun to transform the cliff face between Nile-valley Cairo and the high desert plain of the Giza pyramids.[301] Mansour's report outlined the key issues in selecting the winning design concept, which are remarkably similar to Mizushima's idea of an "intelligent museum" published the year before the competition opened. Integral to the structural design are the "hypertextual nodes of display itineraries" and the thematic "digital streams of light" which guide the visitor through the galleries.[302] The Grand Egyptian Museum will open as a technical as well as a philosophical departure from the traditional cultural guardian and historic repository of nineteenth and early-twentieth-century institutions.[303] This will be a model of the new kind of museum as a multimedia information resource wrapped around five millennia of historical artifacts.

Egypt is currently a leader in applying innovations in information technology and telecommunications to cultural heritage and its dissemination. Because ancient Egypt is a cradle of human civilization, modern Egypt benefits from the substantial international support for world heritage preservation. Tourism is also Egypt's main source of national revenues.[304] The Supreme Council of Antiquities and Ministry of Culture are in the process of revamping,

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[297] Mizushima 70.
[298] Mizushima 68.
[299] Yasser Mansour, "The Grand Museum of Egypt Project: architecture and museology," *Museum International*, 57.1 (2005): 36-41.
[300] Mansour 36.
[301] Mansour 37-38.
[302] Mansour 39.
[303] Mansour 40.
[304] "Egypt: Economy," *Wikipedia*, 27 Dec. 2006 <http://en.wikipedia.org/wiki/Egypt#Economy>.

renewing, or constructing thirty-three museums in Egypt, and developing museum and archaeology education programs.[305] The Centre for Documentation of Cultural and Natural Heritage (CULTNAT) has created the CD-ROM archaeological map of Egypt with 3-D models for virtual visits, and a Geographic Information System (GIS) natural heritage CD.[306] Digital recordings of folklore and music, the "photographic memory of Egypt", and the electronic encyclopedia of Islamic scientific manuscripts are on CD and on-line. The Supreme Council of Antiquities, IBM Corporation, and UNESCO have collaborated with CULNAT to put *Eternal Egypt* multilingual website on line.[307] It is an interesting site with delightful flash animations, zoom-in and 3-D rotation graphics, virtual restorations, maps, histories, timelines, and much more. The graphics make it slow browsing over the net, but the CD should be faster to navigate, and the same resources on a local server would provide seemingly instant access to gallery monitors.

Egypt offers another example of both architectural and digital innovation in the remarkable architecture of the library, which visually dominates Alexandria's harbor. In an ultra-modern facility near the site of the ancient library of Alexandria, the Bibliotheca Alexandrina has catalogued and amassed one of the world's finest collections of rare and renowned Arabic manuscripts as well as some Greek, Latin, Coptic, Persian, German, and French manuscripts.[308] Their collection is far vaster than the priceless items on display in the Museum Showroom,[309] where the "Digital Manuscript Library Project" has placed their state-of-the-art electronic collection on display, including the world's only

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[305] Zahi Hawass, "A New Era for Museums in Egypt," *Museum International*, 57.1 (2005): 7-23. The list includes regional civilization museums, site museums, specialized subject museums, Greco-Roman, Coptic, and Islamic museums, and the three great museums of Cairo (including The Grand Museum of Egypt) of which only seven were completed and open at the time the article was written.

[306] Fathi Saleh and Hala N. Barakat, "The Global Village of Heritage: the contribution of the Centre for Documentation of Cultural and Natural Heritage (CULTNAT)," *Museum International*, 57.1 (2005): 73-78.

[307] <www.eternalegypt.org> Saleh and Barakat 77.

[308] Yussef Ziedan, "The Preservation, Study and Presentation of Manuscripts at the Bibliotheca Alexandrina," *Museum International*. 57.1 (2005): 100-109.

[309] There are 12,000 volumes in the rare-books reading room, 15,000 in the special collections, and almost 100,000 microfilmed manuscripts from other major world collections (104).

surviving papyrus from the ancient library.[310] With catalogues and descriptions provided in Arabic, English, French, German, Italian, Spanish, and Greek, showroom visitors are able, on touch-screen monitors, to electronically thumb through the full-sized pages of digitized manuscripts too fragile or rare for actual handling.[311] Technology simulates the closest thing to actually turning the pages of these priceless artifacts.

Ancient architecture and technological innovation came together in a very different way for another city renowned for its harbor architecture. An important factor in the design of digital museum resources for the anticipated crowds of Olympic visitors to Sydney, Australia, in 2000, was user momentum. Sarah Kenderdine, in her "*guide for multimedia museum exhibits*," reported on the special project for which she was the manager and creative producer at the Powerhouse Museum in Sidney, as that city hosted the Olympic Games.[312] In addition to the "*Treasures of Ancient Greece*" exhibit items loaned by the Greek Ministry of Culture, it included a 3D digital reconstruction of ancient Olympia at about 200 B.C. based on extensive archaeological research.[313] Some restrictions were imposed for reasons of deadlines, resources, and desired user-interactivity time allocation. *Handbook 2* suggested limiting the amount of information available within the exhibit in order to maintain visitor momentum.[314] Anticipating high demand, the virtual tour of Olympia was designed "to force users to complete the tour of the site, with choices along the way, in twenty minutes" or less.[315] The virtual exhibit incorporated not only architectural and landscape reconstructions, but the larger-than-life bronze statue of Zeus (sometimes called Poseidon) in the National Archaeological Museum in Athens, Greece, digitally assembled from detailed laser scans and projected full size.[316]

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[310] The papyrus scroll, physically located at the Austrian National Library, contains favourite selections from the library, which the owner wanted buried with his mummy (102), thus escaping the conflagration of Omar.
[311] Ziedan 101.
[312] Sarah Kenderdine, "A guide for multimedia museum exhibits: 1,000 years of the Olympic Games," *Museum International*, 53.3 (2001): 45-52.
[313] Kenderdine 45.
[314] Hayward 327.
[315] Kenderdine 46.
[316] Kenderdine 47.

The reconstructions not only enhanced the exhibit for visitors to Sydney from August through November 2000, but were also concurrently available to virtual visitors to the special-exhibition Internet site, and distributed as an educational CD-ROM after the exhibit. The site logs identified the audience as 16% from Australia, 55% international, and 29% unknown; and recorded a daily average of 52,582 sessions of twelve minutes average duration, peaking during the games at 92,353 hits on 16 September 2000.[317] Despite the finite resources, exhibit usability and momentum appears to have been maintained, and the Powerhouse Museum's audience was extended globally.

Roderick Davies used the metaphor of the virtual museum, rather than the narrative or book, as a model for real museum navigation, discussed previously as an example of metaphor inversion in exhibit design. He designed a dual-platform program to facilitate the "browsing" navigation of both the virtual and real Birmingham Museum and Art Gallery.[318] Davies referred to a number of museum-visitor studies that supported his approach, including that done by Ben Booth, the Head of Information Systems at the Science Museum in London.[319] Even though the survey respondents and focus groups were visitors to a science museum in the mid 1990s, Booth's conclusions and proposals imply a more general application to "the Information Needs of Visitors to Museums" in general.[320] The demographic profile of visitors and analysis of inquiries suggested the need for better resources for staff and "interactive terminals for use by visitors."[321] Using a quota sampling approach visitors were interviewed for more specific and detailed needs, from which arose the idea of interactive informational and navigational technology,[322] resulting in the "*Guidepoint* system of public terminals [. . .] located throughout the museum."[323] Surveys of hits to

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[317] Kenderdine 50.
[318] Roderick Davies, "Overcoming Barriers to Visiting: Raising Awareness Of, and Providing Orientation To, A Museum and its Collections Through New Technologies," *Museum Management and Curatorship* 19 (2001): 283-295.
[319] Ben Booth, "Understanding the Information Needs of Visitors to Museums," *Museum Management and Curatorship* 17 (1998): 139-157.
[320] Booth 154-155.
[321] Booth 140-140.
[322] Booth 142.
[323] Booth 143.

specific pages of their web site, phone and e-mail inquiries, museum library usage, and interactive media usage at other European museum and art gallery facilities all consolidated, confirmed, and validated a profile of greater user information needs.[324] It appears that the innovations proposed initially for meeting museum-visitor information needs for the London Science Museum contributed substantially to the application of those innovations by the Birmingham Museum and Art Gallery.

Booth also referred to user surveys of other museums, including the *Micro Gallery* at London's National Gallery, a resource room of twelve touch-screen monitors and a laser printer, with hypertext access to 2200 paintings and considerable corresponding data with which to interact.[325] Most *Micro Gallery* users printed information and/or images, 20% made customized tour guides, the majority reported that it "enhanced their enjoyment of the paintings," and almost all anticipated using the facility again on their next visit.[326] A decade later, the *Micro Gallery* is called *Artstart*, and has expanded due to public demand, with monitors in the Sainsbury Wing foyer, the corridor to the main building, and another fourteen monitors in the East Wing Espresso Bar.[327] Those original digital resources and considerably more appear also to be available online at <http://www.nationalgallery.org.uk/default.htm>.

Introducing elements of the unexpected into what could be a rather predictable presentation, the Churchill Museum and Cabinet War Rooms have introduced digital surprises for browsing visitors. In a subterranean bomb shelter beneath the Treasury, a little northwest of Big Ben in London, the actual rooms where Winston Churchill lived and from which he conducted government and war are now a museum. For the most part it is the meticulous preservation of the bunker-style environment during World War II, but one aspect of the exhibit has been described by an exhibit designer as "the most

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[324] Booth 149-150.
[325] Booth 146,148.
[326] Booth 147.
[327] *Artstart*, The National Gallery Trafalgar Square London, retrieved 27 Dec. 2006 <http://www.nationalgallery.org.uk/plan/information/artstart.htm>.

powerful computer interactive that he's ever come across."[328] The war-room contains several long wooden tables forming a rectangle at which the chiefs of defense would meet to plan strategy. A small stack of folders and files appears to be set at each seat around the tables, but when visitors open a file or folder it turns out to be a touch screen monitor displaying Churchill's actual daily agendas. As visitors browse through Churchill's life they encounter surprises such as the screen turning to ocean waves on the day the Titanic sank, to tennis balls on the day Fred Perry won Wimbledon, or to poppies on November 11.[329] When the file of the first day of the Battle of Britain is opened "tiny silhouettes of Spitfires fly across each screen, from one to another" around the tables.[330] All the other visitors along the tables become aware that someone has reached a significant milestone. When anyone opens the agenda page for 6 August 1945 all the screens in the room go white and gradually the words appear on each monitor, "United States drops an Atom Bomb on Hiroshima." The impact on visitors is "really startling."[331] The design of such surprises is not to display clever digital tricks but to provoke thoughtful reflection on the life of a great statesman and give added meaning to the historic site.

B. The Victoria and Albert Museum

In November 2001, three years after the publication of Booth's study and contemporaneous with Davies' digitizing of the Birmingham Museum and Art Gallery, the Victoria and Albert Museum (V&A) reopened its newly transformed section called the British Galleries. Of the museums in the author's acquaintance, this institution comes closest to the idea of a smart museum. Flat tough-screen monitors throughout the galleries and "Discovery Areas" afford visitor access to "computer interactives, videos, and audio programmes, including music and

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[328] Tim Willis, Royal Alberta Museum Project Renewal, personal interview, 6 June 2006.
[329] Anonymous docent, Cabinet War Rooms, telephone conversation 16 Jan. 2007.
[330] Willis interview.
[331] Willis interview.

commentaries on selected objects."[332] Digital resources complement the traditional media of thematically arranged art and artifacts, text panels, and labels.

Figure 7: British Galleries Room 54, Baroque and Palladian Style, V&A Museum .[333]

Figure 7 shows part of the Baroque room with traditional labels augmented by the monitor visible in the lower left of the photograph. Interested visitors can explore the characteristics of Baroque and Palladian styles, related architectural examples, biographies of designers, artists, and cultural leaders of the era, or compare other styles and references in the digital resources available. Three Discovery Areas, such as Room 122b (Figure 8), offer opportunities to interact both with physical artifact replicas such as a try-on corset and crinoline from the 1850s, and with the digital resources on the monitors, such as the virtual building of the Crystal Palace for the Great Exhibition of 1851.[334]

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[332] *Conference Proceedings: Interactive Learning in Museum s of Art*, Victoria and Albert Museum, 17-18 May 2002, 26 Dec. 2006 <http://www.vam.ac.uk/res_cons/research/learning/index.html>.

[333] Brit. G., <http://www.vam.ac.uk/collections/british_galls/galleries/54/index.html>.

[334] Booth's Science Museum and The Victoria and Albert Museum are both continuations of different categories of the Crystal Palace exhibits from the Great Exhibition of 1851.

Figure 8: British Galleries Room 122b, Discovery Area, Victoria and Albert Museum. [335]

Tim Willis, one of four assistant directors planning the "Project Renewal" at the Royal Alberta Museum, candidly admitted he was "somewhat inspired by how beautifully" the Victoria and Albert Museum has blended computers into the British galleries.[336]

> There's a design sense about how they've integrated computers. I really don't like computers sitting as independent modules that sort of take you out of the interpretive flow [. . .] But, the Victoria and Albert Museum use flat touch screen technology to explore particular artifacts in a way that I found was visually clean and complimentary to the display. The computer wasn't calling attention to itself. It just sat as a neat interpretive medium. [For] example [. . .] the flat screen sits next to the interpretive text and invites you to explore the painting by simply moving your finger around. [. . .] As you move your finger across the painting [on the screen] you can zoom in and look at a detail of the painting, which you can't do in real life because the painting is set behind glass and is sort of removed from you, [. . .] and if you wanted to know about the person your finger was hovering over you simply tap the screen and it would bring up a whole bunch of information on this. It was just beautifully designed, very simply, and absolutely worked perfectly. You weren't waiting for information. It was intuitive! I just think they "nailed it" in terms of choosing the right moment to bring the computer to bear.[337]

Though the National Gallery's *Artstart* and Espresso Bar are somewhat comparable to the British Galleries' Discovery Areas, the immediacy of the

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[335] Brit. G., <http://www.vam.ac.uk/collections/british_galls/galleries/122b/index.html>.
[336] Tim Willis, personal interview, 6 June 2006.
[337] Willis interview.

available information to gallery visitors in the Victoria and Albert Museum has no equivalent at the National Gallery. In Figure 9, a visitor is comparing the painting and commode to the information on the monitor before them, the top edge of which appears in the lower right of the image. This and the other images from the V&A website were intended to offer a preview of the galleries and not to illustrate the use of computer technology, however, even their peripheral occurrence demonstrates their integration into the exhibit design.

Figure 9: British Galleries Room 53a, the Rococo Style, Victoria and Albert Museum .[338]

Two keys to the effectiveness of digital displays in an exhibit is the relevance of the default information displayed on any given monitor to the other display material in the immediate vicinity, and the consistent predictability of the interaction required for effective use. Each monitor may access information from a common server, or offer suggestions for related exhibit items at other locations and further information elsewhere, but the starting information should always have as obvious a relationship to the adjacent objects as the printed labels. Willis reported that he found both in his experience. "It was really obvious to me what each interactive was trying to do and it was right there with the interpretive signage always, so once you encountered it you were ready for it the next

[338] British Galleries, <http://www.vam.ac.uk/collections/british_galls/galleries/53a/index.html>.

time."[339] Figure 10 shows an example of the relation between the flat-screen monitor and the interpretive signage to which Willis referred, in this case both elaborating on the design influences of Robert Adam and Thomas Chippendale, and touching the monitor triggers recorded readings from Adam's journals.

Figure 10: British Galleries Room 118a, The Garricks, Victoria and Albert Museum .[340]

Six months after the opening of the interactively transformed British Galleries, the Victoria and Albert Museum hosted a two-day international conference on "Interactive Learning in Museums of Art."[341] Because of the variety of interactive experiences offered at this and other museums, the issues were not specifically limited to digital interactivity, but to the general nature of interactivity in relation to learning, aesthetics, and museums of art and design. However, three of the sixteen presentations are particularly relevant not only to the use of computers in the British Galleries but to the digitally smart art museum in general. Durbin addressed the immediate impact of increased interaction on visitors to an arts museum, Yenawine spoke to the potential impact of interaction on aesthetic experience, and Bradburne applied the concept of "user-language" to the creation of meaningful interaction in engagement with museum exhibits.

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[339] Willis interview.
[340] Brit. G., <http://www.vam.ac.uk/collections/british_galls/galleries/118a/index.html>.
[341] Conference Proceedings: Interactive Learning in Museum s of Art, V&A, 2002.

Gail Durbin, Deputy Director of Learning and Visitor Services at the V&A, reported on the *Interactive learning in the British Galleries* over the previous six months.[342] Among gallery patrons, 44% had accessed digital video interactives and 26% explored further information on the computers. Of these users, 94% affirmed an increased understanding and appreciation of display artifacts. Visitors also doubled the amount of time they spent in the galleries.

> Now instead of 50% of visitors leaving after 11 minutes, 83% of visitors spend more than an hour in the galleries. Empirical observation shows there is an increase in conversation in the galleries to which interpretive interactions contribute, and visitors are sharing information and experiences with each other to a surprising degree. Interactives that ask for personal responses are giving museum professionals a better idea of what is going on in the minds of visitors."[343]

The amount of time spent engaged with art and history exhibits is not in itself a definitive gauge for how much was learned, but the chances of learning something are certainly increased with greater exposure, and the expenditure of valuable time witnesses to the perceived value of the experience. To impart greater value and spark greater interest in further learning is justification enough for investment in digital resources and may be the best that any museum can boast. In many museums, interactive materials seem to have been specifically targeted to children, resulting in a childish or condescending aspect unattractive to teen and adult visitors. However, visitor participation with the intentionally broad-audience interactive resources of the British Galleries has lead Durbin to emphatically conclude that "interactivity is not just for children."[344] Digital interactivity can be designed to appeal to many audiences on different levels without playing overtly to the lowest common denominator.

Philip Yenawine, Co-director of *Visual Understanding in Education*, New York, was asked "Can activity develop aesthetic understanding in visitors?" He

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[342] Gail Durbin, "Interactive learning in the British Galleries," *Conference Proceedings*, V&A, 17-18 May 2002, 26 Dec. 2006 <http://www.vam.ac.uk/files/file_upload/5752_file.pdf>.
[343] Durbin 4.
[344] Durbin 4.

responded with "Notes on Aesthetic Understanding and its Development."[345] Drawing on the complexities of Rudolf Arnheim's "visual thinking" and the extensive aesthetic-development research of Abigail Housen, Yenawine discussed the sheer quantity of time and exposure necessary for this kind of development to occur.[346] According to Housen's research, most young people are in the beginner stage of concrete observations, superficial recognitions, and quick associations with the familiar or the assumption of a brief story being told. Most museum visitors are in the second or analysis stage, with recognition of artist intent, context, technique, and medium. At the third stage, most museum workers view art through the information classification frames of "who, when, how; influences, materials, provenance, etc." Some art professionals, "usually more mature people," reach the fourth stage of "personal association, metaphor and symbol" interpretation, but few synthesize all these into the final stage "of art as part of a philosophical discourse with life."[347] Higher aesthetic development requires focused education and extensive exposure with art over time.[348] Because the pure experience of personally relating to art is simply not achievable by unmediated, brief, and intermittent exposure, exhibit designers need to focus on the needs of their visitors rather than "the higher stage interests of staff."[349] Yenawine applauded the British Galleries as an excellent example of the best that a gallery can do to foster aesthetic understanding, but he doubted that the museum experience alone could completely address so large a developmental issue.[350] A more realistic goal for a museum is to provide the information and experience to help visitors move from the beginner observation stage through the secondary analysis stage, fueling their interest and desire for more understanding or appreciation.

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[345] Philip Yenawine, "Notes on Aesthetic Understanding and Its Development," *Conference Proceedings*, V&A, 17-18 May 2002, 26 Dec. 2006 <http://www.vam.ac.uk/files/file_upload/5756_file.pdf>.
[346] Yenawine 2-3.
[347] Yenawine 3.
[348] Yenawine 4.
[349] Yenawine 3.
[350] Yenawine 5.

Keynote speaker James Bradburne, Director of the Museum fur Angewandte Kunst in Frankfurt am Main, was asked "Is interactivity different for fine art as opposed to design?"[351] One of the motivations of Bradburne's move from the Amsterdam science centre to the Frankfurt museum of applied arts was "to prove that engagement with content is not a question of the nature of the content but with how we interpret it in the museum setting."[352] Contrary to the assumptions inherent in the labeling of exhibition methods or materials as "interactive," he proposed "interactivity as a property of the visitor and [. . .] the exhibit as a tool that if properly conceived, conferred the property of interactivity on its user."[353] The effectiveness of the tool is determined by the "user-language" employed, Bradburne explained.[354] Intense and enjoyable learning occurs when the mind is engaged to the extent that one is oblivious to time or fatigue, irrespective of whether the context is a science, applied arts, or fine arts museum, or whether the interaction is hands-on, digital, visual, or provocative text.[355] In addition to sustained engagement, interactivity requires the visitor to experience what Bradburne calls "variety," or the flexibility of the experience to allow the visitor control of the process, as well as the outcome. In order to achieve Bradburne's "variety," museum staff must understand the nature of the constraints and the "user-language" voices they impose on visitors. "Contrary to some opinions, there are relatively few unconstructed and unmediated moments in a museum setting."[356] The visitor is constrained from arrival to departure by the choices of what is on display, the juxtaposition of objects, the content of labels and text panels, and, "more importantly, the invitation we make to the user to enter into a certain relationship with the museum," which relationship is determined by the user language.[357]

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[351] James Bradburne, "Museums and Their Language: Is interactivity different for fine art as opposed to design?" *Conference Proceedings*, V&A, 17-18 May 2002, 26 Dec. 2006 <http://www.vam.ac.uk/files/file_upload/5758_file.pdf>.
[352] Bradburne 1.
[353] Bradburne 3.
[354] Bradburne 5.
[355] Bradburne 3, 5.
[356] Bradburne 5.
[357] Bradburne 6.

Bradburne identified five user-languages: textual authority, observation, variables, problems, and games. At one end of the continuum, the traditional voice of "textual authority" implies a one-way transfer of information from the authoritative source, with only the accept-or-not option conferred on the user/recipient.[358] Next is the user-language of "observation" which confers the property of authority on the visitor as (s)he looks, identifies, and draws conclusions in a scientific manner within the constraints of the exhibit.[359] For Bradburne, modern museology begins where "variables" extend the observation property from insight into the visible to include invisible relationships between objects and ideas.[360] Real interaction begins with the conferral of agency on the user through "problems," empowering the visitor to action in choosing between discrepant or unresolved interpretations, or even redefining the problem.[361] "Games" confers the potential to interact with other agents/visitors, not necessarily in a formal game or competition, but perhaps in recorded scores or votes, or comparisons with the choices or creations of others.[362] Bradburne concluded that "user-languages that do not confer the property of agency are, in a sense 'exhausted' by their use," because they function only within the constraints of the exhibit context, and that engagement in any kind of museum depends on the choices of user language that reduce the barriers between visitors and artifacts or concepts exhibited. He also assessed the new British Galleries to be "rich in exhibits that employ the user-languages of puzzles and even games."[363] Understanding of the aesthetic levels and needs of visitors and the application of agency-empowering "user-language" to museum exhibits can serve as guides in the development of effective digital content and presentation choices.

These and other ongoing research projects have helped the Victoria and Albert museum in forming what they call their "FuturePlan." The plan includes

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[358] Bradburne 7.
[359] Bradburne 7-8.
[360] Bradburne 8-9.
[361] Bradburne 9.
[362] Bradburne 10.
[363] Bradburne 11.

"enhanced welcome and orientation facilities" and the upgrading of the other collections and displays by the use of "clearer layout and more imaginative and informative displays, [. . . including] state-of-the-art information technology and labeling [to] engage visitors with the works on many levels."[364] For example, Figure 11 shows the monitor on the far right of the watercolour and drawing gallery (not part of the British Galleries). The light-sensitive drawings, watercolours, and illuminated manuscripts rotate through this gallery for relatively short exposures, but more of the collection can be shown on the digital monitors which have proven so successful in the British Galleries.

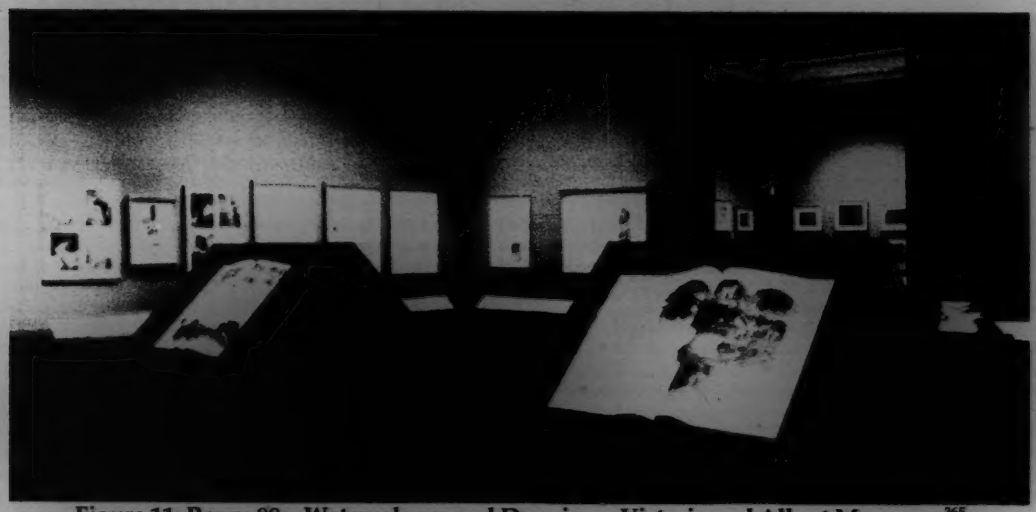

Figure 11: Room 88a, Watercolours and Drawings, Victoria and Albert Museum. [365]

In Room 88a and other painting galleries, the majority of labels and didactic text are presented on the angled panels below the art. The monitor could have been further integrated if it were incorporated into the architecture of the panels, possibly flush with them, or as a movable module that could be horizontally shifted as needed with the rotation of the drawings. Other improvements to the museum and website could include the translation of more of the digital resources into other languages. The V&A website already offers orientation and visit-planning information in Arabic, Chinese, French, German, Italian, Japanese,

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[364] *FuturePlan*, V&A, retrieved 26 Dec. 2006 <http://www.vam.ac.uk/futureplan/index.html>.
[365] V&A, <http://www.vam.ac.uk/collections/paintings/galleries/88a/index.html>.

Russian, and Spanish.[366] The Victoria and Albert Museum continues to set a high standard for museum practice.

C. Canadian Museum Visitors and Computers

There was a time when museum visitors and computer users may have appeared to be distinct segments of society. This section will provide quantitative support for the assumption that digital technology is not foreign to Canadian visitors of museums, galleries, or historic sites, though this technology may appear to be foreign to the exhibits in some of those facilities. The data will show that users of cultural facilities are familiar with and, by inference, comfortable with computer technology as a source of information and research. Though rare, displays offering visitor interaction with computers at historic sites, art galleries, and museums in Canada are welcomed or even expected by patrons.

Cultural facilities patrons may have little computer contact while visiting one of the museums, galleries, or historic sites in Canada. These facilities use computers extensively for research, data storage, management of inventory, and office functions. The Canadian Conservation Institute in Ottawa is a leader in computer-aided art conservation,[367] but visitors will not likely see the computers used for conservation, research, administrative, or archival purposes. Unless the facility is a museum of science or technology, visitors are unlikely to interact with a computer in the course of their viewing of the exhibits, though some passive digital video presentations may occasionally accompany exhibits.

Sean Moir, Curator of Military and Political History at the Royal Alberta Museum, noted one exception to that pattern on a visit to the Canadian War Museum in Ottawa in the spring of 2006. Though Moir is "not a real fan of [. . .] computer screens and computer keyboards [in] museums," he reported that he "was actually quite taken" with the use of flat-screen computer monitors in "a number of areas throughout the museum." Like the Victoria and Albert

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[366] *Victoria and Albert Museum*, homepage, retrieved 26 Dec. 2006 <http://www.vam.ac.uk/index.html>.
[367] Ward 62-63.

Museum, they had eliminated the mouse and keyboard in favor of touch-screen interaction.

> They were by far the best I've seen and experienced in terms of the simplicity and use of them, the clarity of the presentation, the vividness of the presentation in terms of the colour as well, aesthetically, how they were presented, and the fact that you only had to touch the screen once or twice to get to the level where you actually got to the meat of the matter.

He was sufficiently impressed by them to enquire after the name of the display technology company in order to explore their possible contribution to the Royal Alberta Museum's Project Renewal. "It was one of the few situations where I've been attracted to that type of element of an exhibit and actually utilized it." Moir attributes the success of the digital elements to well-designed interactivity "incorporated into the design of the exhibit" without the bulky monitors, mouse, roller ball or keyboard of traditional computers. He anticipates that museum visitors "will begin to see more and more of that."[368]

Statistics Canada (StatCan) adds quantitative measurements to the growing ubiquity of digital technology. Surveys reported a steady increase in personal computers in Canadian households from 59.9% in 2001 to 66.8% in 2003,[369] followed by 70% in 2004.[370] Home Internet access was not far behind with an increase from 49.9% in 2001 to 56.9% in 2003,[371] 60% in 2004,[372] and 61% or 7.9 million households in 2005.[373] The Alberta statistics were consistently higher than the national averages.[374] That means that more than two thirds of the potential audience of museum exhibits had a computer in their own home, and over 85%

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[368] Sean Moir, Curator of Military and Political History, Royal Alberta Museum, personal interview, 27 June 2006.

[369] Statistics Canada, *Market Research Handbook 2005*, Ottawa: StatCan, 2005: 102, 19 Nov. 2005 <http://www.statcan.ca/bsolc/english/bsolc?catno=63-224-XIB>.

[370] Statistics Canada, "Survey of Household Spending 2004," *The Daily*, Ottawa: StatCan, 12 Dec. 2005, 25 Sept. 2006 ,http://www.statcan.ca/Daily/English/051212/d051212a.htm>. The statistics range from 94% in high-income households to 39% in the lowest.

[371] StatCan *Market* 102.

[372] StatCan *Spending* 2

[373] Larry McKeown, "Canadian Internet Use Survey 2005," *The Daily*, Ottawa: StatCan, 15 Aug. 2006, 25 Sept. 2006 <http://www.stawtcan.ca/Daily/English/060815/d060815b.htm>. High-speed Internet access across Canada went up from 35% in 2003 to 43% in 2004 (*Spending* 2). In 2005, 50% of Internet access used cable connection, and of the 44% using telephone connection, 59% were high-speed (McKeown).

of those had Internet access, and the figures have increased since that data was collected.

As access has increased, Canadians have significantly increased their leisure-time Internet use to inform their personal lives. Of Canadians surveyed in the *1998 Time Use Survey*,[375] 32.1% had used the Internet during the previous year for personal reasons outside of work or formal education.[376] Of these 76.4% had used it for communication such as e-mail or other communication methods, but almost as many, 75.5% of them, also used it to research information.[377] The *Canadian Internet Use Survey 2005* revealed that personal Internet use had more than doubled over the seven intervening years to include 68% of adult Canadians, an estimated 16.8 million people, of whom 90% used it from home, two-thirds on a daily basis, and 25% for 10 or more hours per week.[378] E-mail use had risen to 91%, but information research was broken down into ten overlapping categories.[379] Though these two surveys were not completely comparable, they suggest a significant increase in the use of digital resources as a regular personal source for knowledge acquisition. Canadians want to know more and are increasingly comfortable accessing it digitally.

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[374] 72.1% of 2003 households had a home computer, and 60.9% had Internet access (*Market* 104), which household access rose to 71% in 2005 (McKeown).

[375] Statistics Canada, *1998 General Social Survey, Cycle 12, Time Use Survey*, Ottawa: StatCan, 2003, 23 Dec. 2005 <http://www.statcan.ca/bsolc/english/bsolc?catno=12C0016>. All tables generated from the raw data can be viewed in Appendix D. This survey reflects 8-year-old data, though it was only published 4 years ago. It was chosen because of the pertinence of the kinds of time-use questions asked, which change cyclically with each annual survey. This data has been supplemented by more recent surveys of a less extensive nature where such were available.

[376] Appendix D, Table 1.

[377] Appendix D, Tables 2 and 3.

[378] McKeown survey report.

[379] Information searches include general browsing (84%), weather or road conditions (67%), travel information and arrangements (63%), news and sports (62%), medical or health information (58%), consumer product information (57%), government information (52%), education and training (43%), community events including museum exhibits and events (42%), and investment research (26%). Other Internet uses included in the McKeown report were: online banking (58%), paying bills (55%), purchase goods or services (43%), play games (39%), chat and messenger (38%), download music (37%), download software (32%), online radio (26%), communicate with government (23%), online TV or movie (12%), and other non-business use (11%).

According to the 1998 survey, 14.1% of the leisure-time Internet users in Canada, over a million people, visited virtual museums or art collection sites.[380] That category was not specified in the 2005 survey, but since Internet access had doubled one can assume that virtual museum visits have also increased. The plethora of web-related articles in museum journals since 1998 suggests a dynamic increase in virtual-museum sites during the period. Heritage web sites and virtual museums have proven useful in disseminating information about these cultural facilities to a worldwide audience, and inviting them to visit the actual sites and see the actual art and artifacts on exhibit. Increased knowledge of a collection or the significance of a site and virtual exhibits often motivate interested people to visit, rather than eliminating any incentive for real visitation, as was once feared.[381]

Millions of Canadians choose to visit real museums and historic sites in their leisure time as a means of personal improvement and self-education. Of those surveyed in 1998, 32.3% had visited a museum, science centre or art gallery in the previous year.[382] Of those 74.5% had visited a public art gallery or art museum, and of those art lovers, the majority, 88%, visited an art exhibit up to four times annually.[383] The next most popular public facilities were the science centres, which attracted 43.5% of heritage site visitors, followed by the community museums, which attracted 36.7% of the culture crowd.[384] It must be noted that, because many cultural facilities patrons visited museums or galleries in different categories, there was some serious overlap in these percentages. That survey placed the visits to historic sites under a different category. In comparison to the 32.3% of Canadians who visit museums or galleries, the historic sites visitors represented 35.2% of Canadians.[385] The 13.8% multiple visits of 5 or more far surpasses the 2.7% combined figures of all museum sub-categories.[386] This suggests that a third of Canadians were not only interested in their history, but

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[380] Appendix D, Table 4.
[381] Bowen 7.
[382] Appendix D, Table 5.
[383] Appendix D, Tables 6 and 7.
[384] Appendix D, Tables 8 through 11.
[385] Appendix D, Table 12.
[386] Appendix D, Table 13.

nearly half of them were sufficiently interested to visit several historic sites each year.

As with the visitors to different categories of museums, there was an overlap between positive respondents who had visited museums and historic sites during the year. Almost 47% of those who responded had visited either a museum-type cultural facility or an historic site.[387] That represented more than 10.4 million Canadians. Gender differentiation showed less than a percent variance from the combined responses.[388] Also, age did not seem to play as significant a role as one might expect. The proportion of respondents visiting museums and/or historic sites hovered around 50% from ages fifteen to sixty, and then gradually tapered off over the next decades, suggesting physical stamina or mobility might be a contributing factor.[389]

The most recent survey on heritage institutions reported an attendance record of 35 million in 2004, surpassing 2002's 31.6 million.[390] The survey noted 1300 institutions including museums, historic sites, exhibition centres, planetariums, observatories, aquariums, zoos, botanical gardens, and conservatories, but not nature parks or archives. The not-for-profit institutions constituted 86% of the visitor attendance, and the largest visitor category was the 45% museum/planetarium/exhibition centre visitors. Though the data of this survey is not directly comparable to the *Time Use Survey*, it indicated the growth pattern of heritage institution attendance since those 1998 figures. The not-for-profit heritage institution visits rose from 27.2 million in 1999, to 27.8 million in 2002, and to 30 million in 2004. However, as indicated from the overlapping responses in the time-use survey, these figures represent cumulative admission totals, not distinct individual visitors. Therefore a comparison of Canadian population growth during the same period would not indicate whether the

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[387] Appendix D, Table 14.
[388] Appendix D, Table 15. This was true of a number of tables not included here because gender is statistically insignificant to either computer usage or museum visitation according to the 1998 survey.
[389] Appendix D, Table 16.
[390] Evelyn Park, "Heritage Institutions 2004," *The Daily*, Ottawa: StatCan, 26 July 2006, 25 Sept. 2006 <http://www.statcan.ca/Daily/English/060726/d060726b.htm>.

popularity of heritage institutions is increasing or decreasing in the population despite consistent increases in attendance totals.

The breadth of the *1998 Time Use Survey* allowed the direct comparison of responses to different question categories. The statistics indicated a significant correspondence between the Canadian audience of exhibits at museums and historic sites and Canadians using computers at their leisure. This is significant since museum visits are also a leisure activity. Of respondents who had visited museums or historic sites within the last year there was a 62.6% correspondence with the sample that used computers for personal research in their leisure time during the last month.[391] The significant statistical increase in computer use indicated by the other surveys in the eight years since the *Time Use Survey*, suggests that an equally significant rise in correspondence would occur over the same period.

Statistics show a significant decrease in the percentage of Canadians visiting museums and galleries even with steady attendance numbers, due to population growth during the same period. Isme Alam's 2004 comparison of leisure-time statistics from Australia, Canada, the European Union and the United States, revealed global trends over the last decade.[392] In all four cases, audience at cultural events and facilities were decreasing in almost every category as movies or cinema, already in the lead, increased. Computer and Internet leisure activities were also on the increase among financially stable and better-educated families.[393] Against this trend, Canadian statistics actually showed a marginal increases in attendance at dance and cultural/heritage performances and visits to historic sites, but not enough to compete with movie watching.[394] Museum attendance was down across the board.[395]

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[391] Appendix D, Table 17.
[392] Isme Alam, "How Do People Around the World Use Their Leisure Time?" *Focus on Culture*. Ottawa: Statistics Canada, 14.04 (2004): 8-13.
[393] Alam 13.
[394] Alam 11.
[395] Record attendance at the Louvre in the two years subsequent to Alam's study has been partially attributed to a popular resurgence of interest in historical art and religious symbolism, coined the "Da Vinci Code effect" by Sarah Murdoch (2006) because of its association with the media controversy surrounding Dan Brown's book and Ron Howard's film

These trends evidence the shifts in social epistemology that characterise these opening years of the twenty-first century. Computer and Internet leisure use for personal-interest research is on the rise and museum and gallery browsing is on the wane. Luppino suggested, "Galleries have lost audience because we have lost the ability to allow people the experience of a work of art that is a *personal* experience – that is a *transforming* experience."[396] Perhaps for the information-age audience, a personal experience requires some medium for personal investment and personal interaction beyond the passive display of art or artifacts. A transforming experience requires the transformation of the curatorial monologue into a meaningful dialogue. The social purpose of museums and historic sites is to facilitate awareness, understanding, and meaning. Digital technology can assist those ends, offering the display flexibility to tailor art and historical artifact exhibits to the personal transforming experience of twenty-first-century visitors. It is that kind of technology that will make the museum the learning experience that will attract greater audiences.

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by that name. Perhaps Disney's "A Night At the Museum" would have some positive impact on North American museum attendance, if only it were banned by a prominent Catholic official.

[396] Tony Luppino, Executive Director, Art Gallery of Alberta, personal interview, 5 July 2006

III
THREE ALBERTA CASE STUDIES

Within the context of new museological definitions and recommended practices, scholarly trends in humanities computing, international examples, and the Canadian computer-user audience profile, sit three very different selected institutions in central Alberta. Fort George and Buckingham House Provincial Historic Site overlooks the North Saskatchewan River far from an urban centre and focuses on a specific historical period, with a relatively low visitation rate. In contrast, The Royal Alberta Museum, also overlooking the North Saskatchewan, is located in a residential neighborhood of a large urban centre and has a broad scope of exhibits, with a relatively high visitation rate. The Art Gallery of Alberta, in the very heart of an urban centre, is a museum focused specifically on visual art, with a modest visitation rate. Each poses different challenges and opportunities for digital engagement.

A. Fort George & Buckingham House Provincial Historic Site

When the North Saskatchewan River was the "highway" to what is now central Alberta, The Northwest Company and the Hudson's Bay Company built rival fur-trading-post forts on the north bank of the river at Fort George and Buckingham House respectively. Their immediate proximity made this site a hub of frontier commerce in the seventeen-nineties. Though both forts were abandoned in the spring of 1800, this site is historically significant because of the influence of the fur trade on aboriginal cultures and the settlement of Europeans in what would become Alberta. During the nineteenth century, the forts faded into history and ruin. The Northwest Company used some of the materials from Fort George in constructing their Turtle Lake Fort and possibly even Fort Vermilion. The rest burned to the ground before 1809. The wooden palisades, buildings and grave markers at Buckingham House simply rotted away. Bypassed by subsequent rail and highway transportation systems, the

archaeological footprints of the two forts remained relatively untouched until excavated by late-twentieth-century provincial archaeologists.[397]

Today these *footprints* have been identified and marked out with ground planks and token palisade stakes marking the corners, gates, and bastions. An interpretive centre has been built a short walk from the forts, but not so near as to interfere with either the archaeological remains or the beautiful natural surroundings of the historic site. The interpretive centre opens May fifteenth and closes after the September Labour-Day weekend. Located 248 kilometers west of Edmonton (13 km southwest of Elk Point), Fort George and Buckingham House is far from today's beaten tracks. It is a destination, not a stop on the way. Though the Northern Operations Manager suggested that the interpretive centre was not a museum because it focused on telling the historical story rather than on archaeological artifacts,[398] it comes within the International Council of Museums' definition cited previously.

According to the information provided by the 14-year *Attendance Totals* report,[399] over the nine years from 1997 through 2005, an average of 1,828 annual visitors experienced the site during the brief three-and-one-half-month period that the interpretive centre was open each year. That same report shows that, when the interpretive centre was first opened in 1992, the site had almost four times that average, an estimated 6,956 visitors. The novelty seemed to wane as the visitor numbers diminished to nearly half, or 3,718 visitors in 1993, when modest entrance fees were introduced ($2 adult, $1 youth, $5 family). A slight rise in entrance fees ($2.25 adult, $1.25 youth, $5.50 family) corresponded to the lower plateau in the 2,800s during the 1994 and 1995 seasons.[400] In 1996 the current fee schedule was established (($3 adult, $2 senior, $1.50 youth, $8 family). This coincided with three consecutive years of province-wide education-budget cuts, which decimated rural Alberta schools' ability to bus students to regional science fairs, historic sites, museums, and any other educational enhancements

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[397] Marianne Mack, e-mail to the author, 28 July 2006.
[398] Gary Duguay, personal interview, 24 May 2006.
[399] Cultural Facilities and Historical Resources Division, *Attendance Totals*, Edmonton: Alberta Community Development, 2006.
[400] Appendix A, Figure A-1.

beyond the most basic core instruction. These factors may explain the significantly reduced numbers of visitors, especially school students, from the late 1990s to the present.

School children, however, are not the main audience of the site or the interpretive centre. Currently, the educational visitors, including school children, teachers, bus drivers, parents or other assistants, and summer program students, make up only 29.5% of the total.[401] According to the *Daily/Monthly Visitation Record*, only two thirds of that 29.5% were actually school children (less than 20% of total visitors), and boosted the attendance figures only in May and June.[402] This suggests that while educational groups are still a significant part of the audience in the first third of the season, the display strategy need not be designed exclusively to cater to large busloads of children.

The remaining 70.5% of visitors can be profiled over the last six years from a comparison of the *Heritage Facilities Visitor Survey* reports for the years 2001 through *2005*,[403] which do not include educational groups. Though the survey seems to be designed to justify the provincial budget investment by documenting positive economic impact,[404] it also gives a significant demographic breakdown of the visitors, and different categories of satisfaction ratings. The averages of the results recorded in the six reports, show a remarkable consistency over those six years, varying less than 5% in any given year from the averages, with the single exception of group size, which has significantly shifted toward smaller groups. Over those 6 years, visitors were 86.4% Alberta residents, 10.7% from elsewhere in Canada, and 2.6% from abroad.[405] Therefore Albertans seem to be the primary audience. As indicated earlier, Albertans have the highest number of personal computers per capita in Canada, and are

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[401] Appendix A, Figure A-2.
[402] Cultural Facilities and Historical Resources Division, *Daily/Monthly Visitation Record: Fort George & Buckingham House*, Edmonton: Alberta Community Development, 2006.
[403] Heritage and Facilities Visitor Surveys 2000 through 2005. *Tabulations 1: Division Totals, Historic Sites Service Totals and Site Totals.* Cultural Facilities & Historical Resources Division, Alberta Community Development. Edmonton: Infact Research and Consulting, 2001 - 2006. The six-year averages from these survey results are represented graphically in Appendix A, Figures A-3 through A-8.
[404] CF&HR, *Economic Impact.*
[405] Figure A-3.

therefore the most likely to be familiar with or appreciate a digital interface as a method of acquiring information and interacting with it.

The average visitor group had 3.8 members, close to the 4-member average across the Cultural Facilities and Historical Resources Division. Though surveyed groups over the six years ranged in numbers from 1 to 28, the most common size, 31%, were groups of two.[406] That size was on the rise, as in 2005 40.1% of the visitor groups consisted of two people, which was the single exception to the less-than-5% variance from the 6-year averages in this study. This represented almost a third of the non-educational visitors. Groups of 3 or 4 made up almost another third, 34.9% together. Groups of 5 to 7 were much less common at 21.8%, singles were only 6.4%, and more than 7 were the rare 5.8% collectively. There must have been a few family reunions or similar activities on the site to account for some of the higher statistical anomalies. This pattern suggests that digital resources should be aimed primarily at the accommodation of groups of four or less, which account for the majority of visitors.

One limitation of the interpretive centre is the space to accommodate visitor computer access, and therefore the finite number of monitors that could reasonably be made available. The computer allows visitors to have "a lot more information available to [them]," as Becky Dahl observed, but "if you have a number of visitors to the site, how do you make it available to all of them?"[407] In 2005, there were an average of 11 visitors per day, or the rough equivalent of three average non-educational groups per day. For two thirds of the summer there were fewer visitors per day. In groups of four or less, according to a recent study of museum-visitor-group dynamics in response to interactive displays, a single member usually interacts directly with the display while another reads the accompanying text-panel information to the group.[408] Therefore, a single interactive computer station might adequately accommodate the average visitor's needs, and a single large "smart screen" connected to the same data would accommodate school groups and the occasional crowd. Interactive digital

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[406] Figure A-4.
[407] Becky Dahl, Curator, Northern Historic Sites, personal interview 25 May 2006.
[408] The study by Fernandez and Benlloch was previously discussed, see pages 85-86.

media could also be projected onto a large screen to accommodate school or other large groups, with a site interpreter who was familiar with the digital material acting as the intermediary directly with the computer in response to questions or comments from the class or group assembled in front of the screen. In the event of any single visitor monopolizing the computer, the interpretive staff might offer a brochure with the virtual site map and the URLs of several pages on specific topics for home browsing, with a tactful invitation to allow other visitors an opportunity to explore the digital offerings on site. Assuming their arrivals were even somewhat staggered, the installation of two computers would meet the needs of the average 11-person daily visitation in average group sizes of 3.8 members. The size of the present facility could not reasonably accommodate more.

The age range of non-educational visitors was fairly evenly distributed.[409] Consistent with the general pattern of Canadian population trends,[410] the "baby-boomer bulge" swelled the 35-to-49-years age range to 23.2%, and the 18-to-34-years age group was disproportionately narrow for the span of years included in the young adult age range at 11.7%. Computer-hardware and interactive-software marketing generally target the young adult age group, and historic sites might increase repeat visitation by using effective digital interactivity as an enticement to that particular audience. The 7-to-17-age group of 19.5%, translates to 13.6% of the total annual visitors. Combined with the 19.6% of children in visiting school groups, school-age children constitute almost one third of the total audience of the site. However, as the directors and staff of the Victoria and Albert Museum observed, "interactivity is not just for children."[411] Taking advantage of the existing exhibit's successful design to accommodate and complement the Alberta school curriculum, digital resources could augment and make application of the succinctly designed exhibit structure to the interests and needs of the other two-thirds of the interpretive centre's audience.

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[409] Figure A-5

[410] Consumer Affairs. *The Consumer Trends Report: Chapter 3 – Consumer Demographics.* Ottawa: Industry Canada, 2006. 11 August 2006 <http://strategis.ic.gc.ca/epic/internet/inoca-bc.nsf/en/ca02099e.html>

[411] Durbin 4.

Age ranges overlapped within groups. 45.3% of groups included children, 11.2% classified their group as "young adults," 29.8% as "mature adults," and 12.7% as "mixed adults."[412] The interactive material presented must therefore cater to a broad range of age groups, neither limited exclusively to child-oriented interfaces nor to mature vocabulary content. Fortunately, the flexibility of interactive computer data makes it possible to offer a variety of different alternatives between which the different users may choose. It is interesting to note that the large mature adult group is not attracted by personal nostalgia, the forts having been abandoned more than 200 years ago. Perhaps maturity engenders interest in history. That would be a good interest to feed.

Consistently over the six years of survey reports consulted, the top five "main purposes" for the respondent's visit to the area were: 29.5% for a "short getaway or daytrip," 17.3% "to visit this facility or attend an event at the facility," 16.8% "to visit friends and family in the area," 11.8% as part of a "long vacation," and 10.5% were "just passing through."[413] The distance of Fort George and Buckingham House from any sizable population centre suggests that the short daytrip or to visit this facility may be different perspectives on essentially the same motivation, which means that almost half (46.8% together) of the visitors may already see the historical value of the site. They deserve to see and learn something more about its significance. The curious vacationers and passers-through (22.3% together) necessarily had to take a detour from their route to get here and expect to be convinced of the value of this site. The friends and relatives of the local population (16.8%) are also interested but only secondarily, as primarily they were visiting someone else in the area. They and the remaining 14.1% who stopped by while showing friends or family around, on business, personal errands, or for other reasons, need to be engaged in such a way that they might come back with friends or family to share something of value they happened upon. In all cases, the meaningful engagement of digital interactivity could significantly contribute to the perceived value of their experience.

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[412] Figure A-6.
[413] Figure A-7

For 77% of visitors this was their first visit to the site. Some of the remaining 23% of return visitors must come regularly because the average revisit rate is 1.5 times a year, even though 57.5% of the respondents visit less than once a year. Despite the cleverly designed and very informative audio-visual presentations in the interpretive centre, there was room for more dynamically engaging and growing interactive information, which might increase the repeat attendance rate. Such digital interaction would more likely lengthen the average 2.1-hour average time spent at the sight.

Over the six years of the surveys, the overall satisfaction rating remained fairly close to the averages: 59.2% excellent, 39.5% good, 1.1% neither, 0.2% poor and 0% very poor.[414] The pattern is relatively consistent across the division averages. As the satisfaction ratings are broken down into specific areas, the comparatively high percentage of excellent ratings begins to give way to mere good ratings. Excellent satisfaction ratings went from 61% for the exhibits, to 48.2% for "signage on the displays," 43.9% in the areas of "film/audio-visual," and, most importantly, 42.1% in "knowledge you gained of Alberta history during this visit." Digital interactivity has great potential to significantly and positively impact and augment signage information, audio-visual presentations, and historical knowledge resources.

During the 2004 and 2005 seasons, the survey added an open-ended request for suggestions to improve the site, which were clustered into categories for the survey report. During both years respondents wanted to see "more interpretive information about [the] site, on [the] displays, [and regarding] specific items, [as well as] more details on [the time] period, [in order to more fully] bring history to life." Because different visitors had specific areas of interest or questioned different details, computer menus and search engines could effectively customize and accommodate the perceived needs for more clarifying information than signage space can accommodate, more choices between specific details related to display items or the historical period, and more audio-visual segments to dramatically bring history to life.

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[414] Figure A-8

Though the ratings were still good, the comparative diminution of excellent ratings may suggest that visitors accustomed to having more choices about the information available in other electronic media, are harder to please with limited signage space and audio-visual clips edited for typical or school audiences. The beautifully integrated and meticulously prepared video segments of factors and traders would have dazzled and thrilled past audiences exposed only to the passive medium of television. As discussed previously, participation promotes positive identity with the institution, and making choices not only tailors the interaction to the viewer, but also adds value to the knowledge gained (see pages 50 and 59). With more digital information accessible to them at this historic site, the potential choices afforded to visitors in regards to either the depth or breadth of quality information they could access would certainly increase their appreciation of the excellent resources available during their visit, and their perception of the value of this historic site.

There are challenges to providing digital choices as a display medium in any historic-site interpretive centre. Facility Supervisor Marianne Mack pointed out a couple of challenges that could arise from the rural location of Fort George and Buckingham House.[415] The rural power supply does not have as many backup systems as the urban grid. A backup generator could meet this challenge. She also noted the periodic attempts of country mice to seek shelter in the interpretive centre during the off seasons. The wires and casings of the monitors, central processing units and server would have to be secured against penetration by small rodents.

In response to the annual survey's open-ended feedback request, one of the more popular suggestions to improve the site was the desire to see the forts completely reconstructed. Gary Duguay, Manager of Northern Operations and Central Services, recognised that the reconstruction of the forts has always been the wish of the local "friends of the forts." He suggested at least three reasons why the forts were not reconstructed. In the first place, "when dealing with a site

[415] Marianne Mack, personal interview, 25 May 2006.

that is primarily archaeological resources, you don't want to impact those archaeological resources." Any construction or reconstruction on the forts would irreparably damage or obliterate those resources, eliminating "the whole reason the site is significant." A second reason is the limits of accurate information. "Archaeological remains can give you a foot print, but they can't give you any sort of vertical dimension, [. . .] how high the walls were, where the windows were, [or the interior] partition walls, and you certainly have no idea how it was furnished, so reconstruction would be a very expensive process with a very low probability of accuracy."[416]

The third reason is economic. The advocates of the full reconstruction of both forts fail to realise the enormous expenses necessary, both in the capital costs of actual reconstruction and in subsequent operation and maintenance costs. According to Marianne Mack, Fort George and Buckingham House Facilities Supervisor, "The 1985 Fort George and Buckingham House Development proposal looked at three options." In the first, "full reconstruction of [both] forts was estimated at $16 million [. . .] in 1985 dollars." The second option, limited to only a "partial reconstruction [. . .] of Fort George [. . .] and landscaping of historic features, was estimated at $10 million"[417] The Historic Sites division chose the third option of ground marking the building foundations and interpretive signage at the forts, and a modest interpretive centre nearby. Subsequent site enhancement plans have included the palisade markings of the corners, gates, and bastions, but even partial reconstruction is beyond their budget, nor did Duguay see any real hope of recovering those costs. "If we were to reconstruct the forts, I don't see the visitation increasing significantly," he speculated. Though historically significant in their own right, these forts were just fur-trading posts, mercantile operations, "no battles, nothing to catch people's imagination," just warehouses stacked floor-to-ceiling half the year with furs waiting to be shipped out by canoe. The operation costs must also be taken into account. "If you do a reconstruction of a number of buildings," argued Duguay, "then you have to staff them. They take a lot of staff to actually operate

[416] Duguay interview.
[417] Mack e-mail.

[. . .] and to give some sort of story." It requires a minimum staff of four to maintain two people at the interpretive centre at all times. Two multi-building forts would require a small army to adequately and meaningfully staff. There is also the ongoing physical maintenance of the structures to be considered. Provincial funding priorities are not focused on historic sites. Despite funds to celebrate the provincial centennial in 2005, there were budgetary cuts to the maintenance funding of provincial historic sites. The costs of full-scale forts are simply prohibitive.[418]

The digital reconstruction of the forts as a realistic alternative, offers the obvious economic advantage both in costs to construct and maintain the virtual forts, and in the elimination of the need for additional interpretive staffing. It would in no way interfere with the archaeological resources and could be easily updated with new information as discoveries are made, or offer the visitor several alternative possibilities for envisioning the vertical dimensions. A fort-construction program, similar to the environment construction modes of historical strategy games, could even offer visitors the chance to explore their own reconstruction interpretations. At least partial cost recovery could be expected from the sale of a souvenir interactive fort-construction program designed for Compact Disk.

Duguay pointed out a disconnection between the desires of the reconstruction advocates, "who tend to be older," and who want "something tangible, they can touch and see and walk through," in opposition to the experience of virtual reconstructions that might appeal more to "a younger audience," who find digital technology less "foreign to them."[419] While it is no doubt true that reconstruction advocates would prefer to walk through a full-scale physical fort like the experience at Fort Edmonton, that does not eliminate any possible appreciation they might have for a digital alternative. According to Facilities Supervisor Mack, her previous experience dealing with genealogists consulting the provincial archives has demonstrated to her that many of the mature adults visiting our sites, "because of their interest in [history and

[418] Duguay interview.
[419] Duguay interview.

genealogy], have acquired quite exceptional skills on the computer."[420] Her observations combined with those of the author, as an instructor of digital photo preservation and manipulation workshops, lead to the conclusion that, though they may be immigrants to the cyber world, the over-sixty crowd are a demographic group rapidly acquiring digital tools and competencies as earnestly as any other group. In addition, the virtual-reality and augmented-reality tours of Pompeii discussed earlier suggest walk-through alternatives to on-screen digital reconstructions.

Acknowledging this perceived disconnection, Duguay nevertheless appreciated the value of the digital medium as compatible with the objectives of the interpretive centre, which were to tell the story of the site in a way that could be updated with new information as it became available, without jeopardizing the archaeological remains. When asked if he would seriously consider this idea for future development, Duguay responded: "Absolutely! We are always looking at different ways to get across messages to the public, ways that work well for the public and for us."[421]

B. The Royal Alberta Museum

Until the 2005 visit of Her Majesty Queen Elizabeth II to Edmonton in celebration of Alberta's hundredth anniversary, the Royal Alberta Museum was known as The Provincial Museum of Alberta. It had been the joint creation of the federal and provincial governments to celebrate the Canadian centennial in 1967.[422] The museum is located in a high-priced residential neighborhood on a beautiful estate, once the official residence of Alberta's first six Lieutenant Governors, perched atop the steep northern bank of the North Saskatchewan River. The attractive stone-faced building currently houses a large Feature Exhibition Gallery, a small special exhibit gallery, and three large permanent galleries. The Natural History Gallery exhibits include a dazzling collection of

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[420] Mack interview.
[421] Duguay interview.
[422] *Royal Alberta Museum: History of the Royal Alberta Museum*, 5 Aug. 2005, 23 Aug. 2006 <http://www.royalalbertamuseum.ca/general/histpma.htm>.

insects, birds, fossils, and minerals. The Syncrude Gallery of Aboriginal Culture displays an archaeological and anthropological history of Alberta's First Nations. The Wild Alberta gallery houses exceptionally fine dioramas representing the different habitats and wildlife of Alberta's diverse landscape.

During Alberta's centennial, the museum not only received a royal visit and a name change, it was also awarded significant federal and provincial grants for a major expansion to the facility over the next four years. The museum has adopted new vision and mission statements to guide its "Project Renewal" expansion plans. The Royal Alberta Museum's vision is "to help Albertans play an active and informed role in shaping their world by encouraging understanding and appreciation of Alberta's natural and cultural heritage." Its mission is "to preserve and tell the story of Alberta - the experience of people and places over time - and inspire Albertans to explore and understand the world around them."[423] These ambitious statements are accompanied by an even more optimistic campaign slogan - "to build a museum for all Albertans."[424]

The *14-year Attendance Totals* show a gradual overall declining trend in visitors to the Royal Alberta Museum, possibly leveling off near the 200,000-visitor level.[425] Unlike Fort George and Buckingham House, where most of the display is permanent, specific temporary exhibitions affect attendance significantly at the museum. As a result, it is very difficult to attribute the declining statistics directly to any specific causes, but Robin Wywal, Admissions Supervisor, confidently accounted for the attendance spikes in the pattern.[426] The annual attendance record of 352,661 between 1 April 1992 and 31 March 1993 may be attributed to the overwhelming response to the *Whales: Bigger than Dinosaurs* special exhibit. She accredited the over-27,000 visitor rate in 1993-94

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[423] *Royal Alberta Museum: Vision and Mission*, 18 May 2005, 23 Aug. 2006 <http://www.royalalbertamuseum.ca/general/aboutpma.htm>.
[424] *Royal Alberta Museum Renewal*, Royal Alberta Museum, retrieved 1 June 2006 <http://www.royalalbertamuseum.ca/renewal/renew.htm>.
[425] Cultural Facilities and Historical Resources, *Attendance Totals - April 1 to March 31st: 05-06 to 92-93, 14-Year Table*. Edmonton: Alberta Community Development, 2006. See Appendix B Figure B-1.
[426] Robin Wywal, personal interview, 20 June 2006.

and 1995-96 to the *Lego: Invention Adventure* and *Carnosaurs* exhibits respectively. The highest attendance of the last decade was for the *Anno Domini* exhibit over the winter of 2000-2001.

In contrast to the three-and-one-half-month operation of the forts, The Royal Alberta Museum was open every day of the year but Christmas. The museum statistics were tabulated according to a fiscal year from the beginning of April through March. Charting the *Daily/Monthly Visitation Record* by months over the last two years showed a fairly consistent attendance at special functions scheduled throughout the years.[427] April, May, and June had the highest educational visitor attendance from spring school field trips, and July and August the lowest when school was out. However, increased tourist/vacationer visitors nearly compensated for the lack of student busloads over the summer. September was the slowest month of both years, but in 2005 the annual free weekend, usually scheduled on the Thanksgiving long weekend in October, was moved to the Labour-day weekend in September to coincide with provincial centennial celebrations, causing a misleading representation viewed by monthly totals.[428] Free weekends attract remarkable attendance, as does the half-priced Family-Day in February. Occasional special events also attract large crowds, but the regular pattern throughout the year is the weekend peaks in general admission between the weekday dominance of educational groups.

On average, 517 visitors attended the museum every day during those two years, not including Christmas or free and half-price days. Special functions held at the museum accounted for 135 (26%). A very visible 129 of them (25%) were school groups. The remaining 253 (49%) bought general admission tickets. This pattern suggests that half the visitors came to the museum as an informal or unstructured activity; twice as many as those participating in educational groups. Perhaps because of the educational aspect of the museum and the conscious

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[427] Cultural Facilities and Historical Resources, Daily/Monthly Visitation Record: Provincial Museum of Alberta – April 2004 – March 31 2005. Edmonton: Alberta Community Development, 2006; and the Daily/Monthly Visitation Record: Royal Alberta Museum – April 2005 – March 31 2006. Edmonton: Alberta Community Development, 2006. See Figure B-2 in Appendix B.
[428] Figures B-3 and B-4.

association of display content with school curricula, the author has observed a subtle but prevailing misapprehension among interviewed staff that the majority of museum visitors were school children. Such an impression would naturally lead display designers to cater exhibits to the conspicuous school-group minority at the potential expense of the much larger audience.

Like visitors to Fort George and Buckingham House, hundreds of these general visitors participated in the *Heritage Facilities Visitor Survey* every year. Averaging the comparative survey results over the six years from April 1999 through March 2005 allows these visitors to be profiled. As a provincial capital, Edmonton attracts a few more foreign visitors than the forts, but the audience is still 84.5% Albertan.[429] Like the visitors to most cultural facilities, the most frequent group size was two (31.4%), whether couples, friends or parent/child sets. In contrast to the average party size of almost four at the forts, the average group size was closer to three at the museum. Together, groups of four or less constituted over 78% of general-admission visitors.[430] Applying the average distributions to the 253 average daily visitors on an average day, 17 came solo, 80 came in 40 duets, 57 came in 19 trios, 52 came in 13 quartets, 20 came in four quintets, 12 came in two sextets, and the remaining 15 came as a septet and an octet. That pattern indicates only 8 groups of five or more compared to 89 parties of four or less. Some provision needs to be made for larger groups but four or less is the primary museum audience.

The dynamics of such groups frequently suggest that one or more of the party really wants to be there while one or more want to be *with* the serious museum visitor(s). This is especially true of couples. It may be argued that a museum with such a variety of exhibits should have something for everyone, but if the group is there for social reasons as well as the educational and entertainment value of the experience, they likely won't want to split up to find it. Finding alternative digital interaction available frequently and regularly throughout the display presentations might make the experience more enjoyable for everyone.

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[429] Figure B-5.
[430] Figure B-6.

The age distribution of visitors to the museum was an even better reflection of Canadian demographics than the forts.[431] This can be accounted for in several ways. The variety of exhibitions, both permanent and temporary, attracts a more even cross section of the population. Being in a metropolitan centre makes it available to larger audiences, and being open all year allows for greater audience diversification. The 1950s baby boom is still affecting the demographic bulge in the 35-to-49-age range.[432] The overlapping of these age ranges within the visitor groups, means that display design, whether digital or traditional, must offer a wide range of engagement opportunities, both in content and delivery, to meet the different needs and expectations of so diverse an audience. With children included in over half the groups,[433] the dynamics of an adult mentor and child or children plays into the design of the display interface. To allow the group to have a meaningful learning experience together, the computer hardware must avoid the appearance of an electronic toy or pinball machine, suggesting the exclusive play of the child while the adult does something else. The screen imagery should be equally attractive to mature and young adults, and not appear childish or resemble cartoons. The very entertaining media work of David Attenborough[434] or Alberta's John Acorn[435] attest to the cross-generation popularity of well-presented educational content. The physical content in the current museum displays appears to aim at the broader audience.

Unlike the six-year consistency of the Fort George and Buckingham House statistics, the much larger and more diverse Royal Alberta Museum visitors reported more dramatic shifts in their motivations to be in the area. The most popular average motive over the six years was to visit friends and family living in the area.[436] This has risen from less than 30% to over 45%. This suggests a

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[431] Consumer Affairs, *The Consumer Trends Report: Chapter 3 – Consumer Demographics* (Ottawa: Industry Canada, 2006).
[432] Figure B-7.
[433] 52.9%, Figure B-8.
[434] BBC's David Attenborough produced Kenneth Clarke's *Civilization*, *The Living Planet*, *The Life of Birds* and *The Blue Planet* among other things (Hayes).
[435] John Acorn's *Acorn: The Nature Nut* and *Twits and Pishers* are broadcast on the Discovery Channel, The Learning Channel and PBS (Pilger), as well as segments viewed at the Tyrell Museum.
[436] Figure B-9.

trend moving toward half the general visitors coming to the museum as a social activity to be enjoyed while with friends and family. An important consideration in the design of digital interactivity must therefore be the impact on the social interaction of visitors.[437] The view of this facility as the specific destination of a dedicated trip, though the second most popular choice overall, has actually fallen from almost 27% to less than 7% over the six years. This represents a significant depreciation in the value of the museum among those who *are* visiting it, to say nothing of the larger population that is not. This trend is consistent with the general societal depreciation of museums and galleries in Alam's comparative study of leisure activities.[438]

Less dramatic fluctuations have characterised the neck-and-neck statistical race between the short getaways and the long vacations as the main purpose of the museum visit. Without access to the original raw data of the survey to cross-tabulate, one can only assume that the short day trippers are residents of Edmonton's greater metropolitan area and the long vacationers are mostly from elsewhere in Alberta, both of whom included a stop at the museum as a part of their itinerary, though not its first goal. Their recognition of the value of the museum is something to be developed and nurtured, by providing them as many ways as possible to appreciate the collections and functions of the museum. The remaining choices averaged less than 3% each, suggesting that museum visits are far less often an incidental stop on the way to something more important, and far more often an important component of a visit to Edmonton or a local retreat. Over the last six years of surveys, only 25.3% of visitors were coming for the first time. They were included in the 36.2% who visit the museum less than once a year. The remaining two thirds usually returned two or three times. The statistical average is 2.4 visits per year among all survey respondents.

Without much fluctuation over the six years, visits averaged a very respectable 2.4 hours in duration, a short time in relation to the volume of exhibits available in the museum, but perhaps return visitors who come for the

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[437] Fernandez and Benlloch 58-59.
[438] Alam 8-13.

special exhibitions, do not return to all the familiar permanent exhibits. Changing emphasis or adding to digital components in a permanent gallery is far easier with current software than changing the components and physical layout of regular displays. Digital display technology could keep exhibits fresh, engaging, and add value to visitors' experience and reappraisal of even familiar artifacts. The experience of the Victoria and Albert Museum in extending the duration of visits in their British Galleries from 50% spending 11 minutes to 83% spending over an hour attests to the added value of digital interactivity to increase engagement with exhibits, not to mention Durbin's observation of fostering increased social activity and information sharing between visitors.[439]

Despite the quality of exhibitions and the expertise of the curatorial staff, the museum is not impressing visitors as highly as might be expected. The satisfaction ratings vary over time more than those at the forts, and the averages fall shorter in all five of the categories selected for this case study.[440] The excellent overall satisfaction rating was given by just over half the visitors, 14.2% lower than the Cultural Facilities and Historical Resources divisional averages. The higher excellent rating with the actual exhibits (56.7%) indicates appreciation of what is on display, but satisfaction drops significantly in regards to the ways in which meaning is communicated in relation to these displays. More people thought the display signage was good than thought it was excellent. In the audio-visual evaluation, more people had no response than gave an excellent rating, and the neither-good-nor-bad rating was almost as high. A few seconds of birdsong or native chant does not impress many people today. Satisfaction with what visitors learned about the history of Alberta was only a little better (21% excellent), despite the panoramic displays of the Alberta history in the Syncrude Gallery of Aboriginal Culture.

Currently, the only computer interaction available is in the Wild Alberta Gallery,[441] where there are nine monitors with large ball and button interface in

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[439] Durbin 4.

[440] Compare Figure A-8 with Figure B-10.

[441] In the Syncrude Gallery there was one computer, which was supposed to offer an introductory Cree-language lesson, but was out of order during all the author's visits throughout the spring and summer of 2006.

the gallery and two in the mock "field station." Unfortunately both the hardware and software appearance of the gallery computers resemble toys designed for children's play, not devices on which teens or adults learn. Even the physical location of the computers, which may actually reflect accessibility accommodation for wheelchair visitors, gives the impression that they were designed for young children. The cute look may have been chosen to appeal to the elementary-school busloads at the time of the installation, but is perhaps less appropriate to the much broader audience of the museum and the quality of the potential information that could be displayed. Both the technology integration and the interface design are crucial to effective museum application. Ineffective application of technology does not negate its potential for effective use. On the positive side, the "teaching area" of the mock field station also has "smart board technology" which can display all six "of the computer interactives within Wild Alberta [. . .] so indeed the interpreter can take [groups] through the 'fish quiz' or through the 'caribou tracking' program."[442] Perhaps the introduction of more digital interactivity could offer patrons different approaches to Alberta history, which would capture the imaginations of more people. After all, the slogan of "Project Renewal" is "to build a museum for all Albertans."[443]

"Project Renewal" has been divided into primary and secondary phases. Phase one, to be completed by 2011, will roughly double the exhibition space of the Museum, and significantly add to collections spaces, offices, and laboratories; provide underground visitor parking; and enhance the usability of the present facilities.[444] A new wing will extend south from the present building to the edge of the embankment overlooking the North Saskatchewan River. The new permanent galleries will include Ancient Alberta, Alberta Archaeology, and Alberta History. There will be new locations and new looks for The Bug Room, Wild Alberta, and Aboriginal Culture galleries. Two new features of the renewal will be the Children's Museum and the Information Zone. According to the

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[442] Willis interview.
[443] *R.A.M. Renewal.*
[444] *Project Renewal: Royal Alberta Museum,* Renewal Mediakit.pdf: 3 and 6, accessed 5 February 2007 <http://www.royalalbertamuseum.ca/renewal/_pdf/mediakit.pdf>.

museum's Director, the renewal will bring the museum more in line with modern museological trends.

> Museums are changing around the globe. No longer shrines to rare and isolated objects, they are increasingly vital educational and recreational community resources. The trust placed in Museums by the public confers enormous responsibility on us to provide users with engaging but objective information and authentic experiences.[445]

Tim Willis, one of four Assistant Directors planning the expansion, has "thought long and hard about the role of computers in the new galleries, [has] done a fair bit of research" on this topic, and definitely recognises "a role for interactive computers in the new museum," though not necessarily "as a standard medium in all galleries."[446] While conceding that "computers have infinite variability in terms of whose needs they can address," Willis wants to be very "clear about what the computer is there for," whether elementary-grade children, casual browsers, or serious researchers, and design both the hardware and software to convey that purpose immediately. "If your computer is for the majority of visitors, then it has to be intuitive, it has to be absolutely crystal clear, and engaging." He wants to avoid the environment observed in some science centres, which encourages children to run frenetically from one interactive device to another, pausing only briefly to initiate a response before dashing to the next, without actually learning anything along the way. Willis referred to an American study "where some museums that had [placed] a lot of emphasis on new technologies were finding that kids were saying 'well, I can get that at home – this is not that cool.'" Therefore Willis focuses not on what computer technology can do, but on "how to use the technology to make the presentation of the real thing more engaging and more interesting, and that's why I think the clever subtle use of technology is where it's at – it's not in the whiz-bang stuff."[447]

With more galleries, there will be more interconnections between them than ever before. Helping people make these connections and navigating between

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[445] W. Bruce McGillivray, *Director's Message*, Royal Alberta Museum, accessed 5 Feb. 2007 <http://www.royalalbertamuseum.ca/renewal/renew.htm>.
[446] Tim Willis, personal interview, 6 June 2006.
[447] Willis interview.

them can be facilitated by technology. "Our director is very interested in the use of technology to guide people through museums," said Willis. "We've tried at various times with acoustic-guides and the old technology of cassette-tape audio tours, and some of them were very effective but technology has moved on." Willis gave two examples of current digital-audio technology.

> The Getty Museum in Los Angeles, one of the richest museums in the world with a beautiful new building, has a very simple technology, a handheld device. If you want to know more about this painting, the painting has a code, you've got your device, you plug in the code, and you get the curator telling you something about it. It's not a prescriptive tour – it's totally driven by where you are in your visit – but it's hugely flexible. It comes in many languages, it addresses all kinds of aspects of the museum and its collections, but you're the one that activates it [and] you're the one that controls it. [. . . Nevertheless, it presents its] own dilemma, in that most museum visits are social occasions, and so the downside of the acoustic-guide is that it isolates you. [. . .] The Smithsonian is using [information tailoring] where it doesn't end with your visit. [Using your own cell phone] you've plugged in your coordinates, and you've taken your device on a tour, and maybe the computer says to you, "we've noticed that you're really interested in moths – would you like to get our moth bulletin?" or "Do you have a question for the curator?" If you feed in your [e-mail address] it will follow-up after you leave the museum, and that's fascinating! [. . .] In the ideal world you would have all kinds of technology to suit the different needs of the visitors.[448]

The Project Renewal team will continue to monitor technological developments over the next four years before committing to specific applications. Anticipating technological innovation, the architects and designers on the consulting teams will need to ensure the maximum flexibility in the infrastructure to support the potential deployment of computer technologies.

C. The Art Gallery of Alberta

The Edmonton Museum of the Arts was founded in 1924, and exhibited in a variety of different locations over the years, including the Hotel Macdonald and the old Edmonton Public Library, until the Edmonton Art Gallery was opened in 1974 on Sir Winston Churchill Square, in the heart of downtown Edmonton. Dwarfed by the subsequent construction of the Law Courts behind and the City

Hall in front, the blocky concrete structure is now scheduled for demolition, to be replaced by a larger metal and glass architectural sculpture, which will hold more exhibition space and project a more commanding visual presence on the square.[449] Like the Royal Alberta Museum, the gallery's "New Vision" called for a name change, and seeking a wider revenue base for the gallery's fundraising campaign, they have assumed a province-wide constituency as "The Art Gallery of Alberta."

The comparison of attendance totals over the years from 1996 to 2005 revealed a ten-year average attendance of 34,016 visitors per year.[450] Though that number represented more than five times the visitors during a comparable period at Fort George and Buckingham House, it was only 17% of the Royal Alberta Museum's average. The Art Gallery of Alberta does not follow Alberta government practices in the formulation of their statistical data records or visitor surveys, so the audience profiles are not as comparable as the Royal Alberta Museum with Fort George and Buckingham House, however, the pattern of the annual averages are. The gradual decline in attendance at other cultural facilities is visible in the first five years of the records, sliding from 32,705 in 1996 to 26,523 in 2000. Under new direction, the attendance jumped to a record 48,720 in 2001, but the declining pattern returned bringing the annual total to 35,447 in 2005. Tony Luppino, Executive Director, attributes the improved numbers to increased awareness.

> When we run an ad on Friday we get 300 people, particularly on a good exhibition, and when we don't run an ad we get 80 people. It's really that simple. The problem with museum going and gallery going is not about interest or satisfaction, it's about awareness.[451]

Even though the declining pattern in the last five years has remained above the ten-year average, increased advertising has not reversed the decline, only

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[448] Willis interview.

[449] Randall Stout's stylized northern-lights concept is reminiscent of Frank Gehry's 1997 Guggenheim Museum, Bilboa, Spain, a recognized triumph of computer modeling design.

[450] The profile statistics in this section are derived through the comparison of the *EAG Attendance Data* and *Comparison Attendance Numbers* documents of the Edmonton Art Gallery, 2001 through 2005, provided in an e-mail to the author from Ron Gregg, 11 July 2006. See Appendix C, Figures C1 through C-4.

[451] Tony Luppino, personal interview, 5 July 2006.

raised the slope.[452] Ron Gregg, Director of Administration at the gallery, noted with some frustration that quadrupling the advertising budget has resulted in an attendance plateau at roughly 35,000 visitors, less than 3% above the ten-year average.[453] He referred to a number of studies by consultants.

> "They specialize in the arts, art galleries and museums, and [. . .] have statistics and files and documentation on size of communities and what you should expect. In the Edmonton area we should be drawing 120,000 people annually. That was five years ago, and the population has grown exponentially since then, so we should be looking at drawing 150,000 people, [. . .] but, we're bringing in one fifth of that! Why? The problem for us is that we haven't been able to identify what the issues are – why aren't people coming in?"[454]

The ten-year comparison showed a monthly pattern of quarterly peaks in February, May, August, and November, roughly correspond with show openings, and giving support to the advertising effect on attendance.[455] Like the Royal Alberta Museum, September had the lowest attendance, without regard for what is on exhibition or advertising dollars spent. Greater engagement with the art, mediated by digital resources along the lines of the V&A's British Galleries might encourage more repeat visits, and placing more digital resources on the galleries website could seriously improve awareness.

The weekly attendance pattern over the past five years showed a fairly smooth incline of daytime visitors from 9.6% on Monday to 17.5% on Sunday (Figure C-3). The gallery is regularly open on Thursday evening, which only accounts for 7.2% of visitors, but boosts Thursday's total attendance above Sunday's. Fridays evenings are reserved for special events and show openings, and though irregularly open to the public, account for 4.7% of total visitors, boosting the Friday totals to 18.8%, only 0.7% above Thursday. This heavy weekend and evening attendance pattern can be partially accounted for by the pattern in admission records.

Unlike the demographic pattern of visitors to the forts or the museum, which corresponds roughly to the general Canadian population, the gallery is

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[452] Appendix C, Figure C-1.
[453] Ron Gregg, personal interview, 5 July 2006.
[454] Gregg interview.
[455] Figure C-2.

mostly attended by working adults, who are free to attend on weekends and evenings. Attendance records over the last six years break down as follows: 30.5% walk-in adults, 27% other (free passes or coupons, sister gallery memberships, free Thursday evenings and Family Day), 17% tours, 10.2% students (school and university), 6.4% members, 4.9% seniors, and 4% Children under 6.[456] Unfortunately the gallery's data collection does not allow any specific further breakdown, but even if 85% of the tours were school groups,[457] the majority of visitors, 72%, were adults. Based on this data, the digital resources need to cater primarily to adults who want to improve their aesthetic appreciation of art, in the stages outlined by Yenawine.

Is the Art Gallery of Alberta a Museum? Executive Director Luppino emphatically insisted on the distinction between a gallery and an art museum. In his view the Art Gallery of Alberta is an art gallery and not an art museum because of its focus on experiencing the art rather than learning about the art, the artist or any historical or other related contextual information. A major reason for his resistance to digital technology in a gallery was based on this distinction, and his fear that providing too much information and too many choices would interfere with the "pure experience" of the art.[458] There is always the potential of inadvertently creating barriers instead of windows in any medium, digital or otherwise, however observation of visitors in galleries suggests that they feel no obligation to engage in interactive media.[459] Though Luppino quoted the Vision Statement, "The Art Gallery of Alberta creates a welcoming and engaging environment where people are motivated to transform their understanding of the world by connecting with the visual arts,"[460] his interpretation of "engaging" and "connecting" excluded digital interaction which "may do as much *harm* as good" by driving visitor to seek

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[456] Figure C-4.
[457] Barry Reed, Administrative Assistant, Art Gallery of Alberta, estimated 85% of tours are school groups under college age. Telephone interview, 12 February 2007.
[458] Luppino interview.
[459] The studies of Fernandez and Benlloch, and Durbin have already been discussed.
[460] *Mandate*, Art Gallery of Alberta, accessed 28 August 2006 <http://www.artgalleryalberta.ca/gallery/mandate.html>.

information at the expense of a "*pure* relationship to the object."[461] But as Yenawine pointed out, most gallery visitors do not arrive with the aesthetic training or experience taken for granted by so many museum staff, and they need more information in order to have any relationship at all to the objects on display.[462]

On the other hand, public art galleries and art museums both come within the International Council of Museums' definition. The gallery also calls itself a museum in its posted Mission Statement: the "Art Gallery of Alberta is a museum dedicated to excellent and innovative practice in programming, stewardship, and presentation of visual arts in Western Canada and across the nation."[463] The "Curatorial Vision" also leaves a great deal of room for exploring digital potentialities as enhancements to visitors' "connecting with the visual arts." It lists the goals towards which the curatorial staff and board members are striving. This list includes, "keeping our audience at the centre of planning for the future."[464] That planning must include the rapidly growing audience of "digital natives" and "digital immigrants,"[465] who understand and relate to the world through the "new media environment."[466]

Another goal is, "participating with our audiences in an exploration of visual culture through balanced program of historical, modern and contemporary art exhibitions." Participation in exploration must mean more than passive exposure to visual culture. Luppino assured the author that "three lines" give visitors all they "need to know" to appreciate the art at the time of viewing.[467] For some that would be sufficient. Unfortunately, not all the gallery's audience has had even one introductory art-history course. If the contemporary audience can relate to contemporary art, which may require considerable explanation to appreciate, historical art exhibitions need at least some historical perspective. For many viewers that means more than the title, artist and date, or even three lines

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[461] Luppino interview.
[462] Yenawine 3.
[463] *Mandate* AGA.
[464] *Mandate* AGA.
[465] Anderson symposium address.
[466] Deibert 142.
[467] Luppino interview.

of didactic text. Digital interactivity affords visitors a vehicle through which to participate "with [the curatorial staff] in an exploration" of paths to the meaning and value of visual culture, for those who want or need more.

Two other goals have to do with the educational role of the gallery: "sustaining the highest levels of quality in educational and other complementary programs and activities," and "contributing to visual literacy, life-long learning, and the quality of life of all Albertans." There is a common expression not exclusive to Alberta art viewers, "I don't know anything about art, but I know what I like!" Exposure to art alone will only give viewers more to like or dislike. Alternative approaches to the art offered as choices in digital interfaces increase the educational potential of gallery visits. Successful visual-literacy learning experiences should give even the least aesthetically cultivated viewers some idea of why they like what they like, and maybe even an appreciation of the value of what they don't like.

Part of the Alberta Art Gallery's "New Vision" is a new focus on their permanent art collection. The old Edmonton Art Gallery building is scheduled to close forever this year and the new Art Gallery of Alberta anticipates a grand opening in 2009. The architectural pendulum will have swung from a plain shell enclosing art treasures to a modern-art sculpture competing with the contents, essentially an addition to the permanent collection. The new facility will not only attract more visual attention, it will also allow the gallery to exhibit more and bigger exhibitions. The "New Vision" also includes a "state-of-the-art permanent collection storage and conservation centre [. . . now] in the final stages of construction."[468] Though the 6,000 works of the collection includes Canadian and international art, it has focused particularly on Alberta and First Nations artists. According to the Executive Director, putting the permanent collection on exhibit "is essential in our situation because it makes the community feel ownership of the place, [. . . that] this is *my* gallery, I aught to know what is there, feel like its

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[468] "Making the Permanent Collection Permanent," *New Vision Update*, Art Gallery of Alberta, accessed 12 Feb. 2007
<http://www.artgalleryalberta.com/news_events/news_items/NewVision.htm>.

mine."[469] He conceded that the permanent collection would be the best area for providing more digital information resources either online or at the museum. In a recent posting, Luppino affirmed, "The New Vision includes expanded access to the collection on the Internet and a gallery in the new building dedicated solely to the permanent collection. This means that care and conservation of the collection must be a priority.[470] Hopefully that priority will include the building of a meaningful online art resource and not just the uploading of an inventory database to the net.

The preparation of a temporary exhibition facility during construction and the removal of the permanent collection to the new Collection Services Facility will complete the first phase in the New Vision, but the grand opening of the new gallery will be the ultimate realisation of the vision. The public and private investment, as well as general curiosity will ensure initial attendance successes. "Once we open the new building in 2009, that first year, yah! I bet that we'll get that 150,000," assured the Director of Administration.[471] "We might break that 150,000 and maybe the second year [also]." He anticipates that many visitors are "going to come once to see the building. They'll look around to see what shows are on, because they've paid to come in, but they're coming to see the building." This will be the ideal opportunity to make the gallery experience so engaging, entertaining, educational, and meaningful that it ensures an ongoing patronage. However, if the museological practices and exhibition style remain the same, patronage is likely to resume the decline evident in the current statistics. Gregg expressed concern for the post-novelty future. "My fear is that once we get past that initial novelty [. . .] we're going to go back down to those normalized levels, and that's the issue for us as an organization."[472]

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[469] Lappino interview, emphasis by Loppino.
[470] Tony Luppino, *Director's Message*, Art Gallery of Alberta, Jan. 2007, accessed 12 Feb. 2007 <http://www.artgalleryalberta.com/news_events/news_items/directorsLetter.htm>
[471] Gregg interview.
[472] Gregg interview.

D. Alberta Museum's Common Concerns

Despite the obvious differences in the situations of these three institutions, they also share fundamental common ground as cultural-heritage institutions of the arts-museum category. Many common concerns and suggestions were expressed during the author's interviews with curatorial and administrative personnel of these institutions. Those concerns and suggestions may be clustered around the following eight issues: interpretive information, digital databases, web sites, resource rooms, gallery displays, computer interfaces, human resources, and budgets. It is not the intent of this thesis to identify all the contributions and opinions of those interviewed on any issue. It is sufficient to note that quotations or references in the following sections are usually representative of comments by several individuals at different institutions.

1. More interpretive Information

Many visitors to museums and historic sites would like to know more than the information provided on interpretive text panels. The Heritage and Facilities Visitor Surveys 2004 and 2005 added an open-ended request for suggestions to improve the facility. The responses were clustered into categories for the survey report. Both years respondents wanted to see "more interpretive information about [the] site, on [the] displays, [and regarding] specific items, [as well as] more details on [the time] period, [in order to more fully] bring history to life." Though even the familiar could benefit from reexamination, the further removed an artifact is in time or cultural background from the viewer, the more information the viewer needs to relate to, understand, or find meaning in that artifact. As twenty-first century museum visitors turn increasingly to digital resources to inform their life experience, the appropriateness of providing digital information to inform their museum experience increases.

Bridging the information gap is one reason for hiring and training interpreters at historic sites, but they have limited knowledge and experience. Marianne Mack, Facilities Supervisor responsible for Fort George and Buckingham House staffing, proposed that the digital display could be an

excellent and flexible tool in accomplishing multiple ends. For interested guests, it could augment the information already on display, and for site interpreters, the interactive data could serve "as a learning module" to orient new interpreters, and as a resource from which, "at their own speed, they could continue to learn" during slow times throughout the season.[473] The interpretive centre foyer at Fort George and Buckingham House was designed with large windows to encourage visitors to get outside and onto the actual fort sites. As Duguay pointed out, "This facility is an interpretive center rather than a museum, so the focus is less on the artifacts and more on the story of fur trading and how that site functioned."[474] Nevertheless, there are secondary stories that also capture the imagination and interest of many historic-site and museum visitors, and add value to their experience. These need not compete with the primary story presented in the artifact displays and site markers, but digital displays can present additional or alternative choices for the interested visitor. Mack pointed out, "A computer gives you a capability of saying, we assume *based on this information*, that this is what the structure looked like."[475] For interested visitors, interactive digital display information affords the opportunity not only to learn the story of the forts, but the story of the archaeological work at the site, and the rational behind the interpretative choices. They want to know the why and how of what was or is being done at the site. Many visitors show as keen an interest in the profession of historical and archaeological preservation as in the archaeological resources found or the history of the fur trade.[476]

The new historical galleries at the Royal Alberta Museum anticipate telling more of that story. John (Jack) Brink, Curator of Archaeology, is a real proponent of using technology to help tell the story.

> The potential is there to [digitally] recreate the past environment, and the people, and the things, for visitors [to] walk away with a much greater and deeper understanding of what actually went on. I can write the same things in the text and say an ancient tee-pee camp would have looked something like this, and people would have been doing these things [. . .

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[473] Mack interview.
[474] Duguay interview.
[475] Mack interview, emphasis by Mack.
[476] Mack interview.

> but] people just won't stand there and read it. [. . .] When people go through museums, if they connect with something, feel a closeness to it in some way, whether it's the person that made it or the object itself, [. . .] they're going to walk out and say therefore "that stuff is more valuable. It needs to be conserved and protected, because I've connected with it somehow." Mostly we fail at that because I don't think people can connect with a row of arrowheads on a glass plate or scraping tools, or the various things that I can show. [. . .] I think of all the disciplines in the building, archaeology perhaps has the strongest case to be made that [virtual reconstruction] is a relevant technology for us, because we're trying to make people think of things that are so foreign to them, they have no experience to draw on. [. . .] I'm asking people to go places they've never been and see things they've never seen.[477]

Many gallery visitors also want to know the story the artwork does not tell; the provenance story (though they may not call it that), or the artist's life story, motivating experiences, and reciprocal influences. Though curators try to provide a certain amount of that in didactic panels, for some who "want to know the story behind," it may even be "more important to me than actually looking at the painting."[478] As in most populations, the average Albertan is not generally characterised by refined connoisseurship, but at the Art Gallery of Alberta average Albertans are invited guests.

This idea of telling more of the back story was echoed by Becky Dahl, Curator for Northern Historic Sites, and Carol Wilkinson, Collections Manager for all of Alberta's Historic Sites.[479] The Fort George and Buckingham House Interpretive Centre displays only reproductions in the gallery.[480] On-site digital resources could give visitors visual "access to more of the original archaeological items from the site," now in the Provincial Archaeological Survey collection, and only the occasional selected items are loaned to Historic Sites for specific site special exhibits.[481] Many of these original items are corroded, damaged or fragmentary.[482] Such a digital display would allow visitors to "relate [the archaeological collection] to visuals of the complete items," making the

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[477] Brink interview.
[478] Gregg interview.
[479] Becky Dahl and Carol Wilkinson, personal interview, 25 May 2006.
[480] Wilkinson.
[481] Dahl.
[482] Wilkinson.

interpretive experience more meaningful, because for most of us, "unless you *see* it, it is hard to imagine."[483]

This level of information may not necessarily be of interest to every visitor. "How do you handle the different levels of information, [. . .] how much information each visitor wants? I think the computer will handle that a lot easier than a text panel, [. . .] allow a little more flexibility there" (Wilkinson). By giving the user choices through such common hyperlink devices as thumbnail images and the *read-more* or *full-story* links, each user would determine the amount of information she or he was prepared to absorb onsite. The periodic repetition of the web address to specific Alberta Community Development web pages also offers the visitor the option of postponing further in-depth inquiry until a later at-home browsing session.

2. Digitization of Inventory and Metadata Files

Many arts and historic facilities personnel share concerns over the accessibility of the resource information. The common need is for competent people to do the job. Of several hundred thousand photographs in the Royal Alberta Museum's archival library, Brink estimates "maybe 5% at present has been digitized." It is gradually being done by the occasional grant for a summer-student, but digital photography has made a difference for newer additions.

Luppino has made the digital publishing of the Art Gallery of Alberta's permanent collection part of the gallery's New Vision. Pamela Clarke, Assistant Registrar, maintains the current database.[484] She reported that the majority of the collection is digitally photographed, and the remainder will be completed during the move to the new storage facility. Images in the photo-archive are identified by the corresponding "Harris Number" in the database, but access is restricted to staff and university-student researchers with special permission. "Most of the collection data [is] on the CHIN (Canadian Heritage Information

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[483] Dahl.

[484] Pamela Clarke, personal interview, 5 July 2006. At the time of the interview she was the only person working on the digitization of the collection, the database, or the website. Hopefully the New Vision for the virtual permanent collection gallery includes support personnel.

Network) website [. . .] very basic information: artist, title, accession number, medium size, no images." Because most of the collection was acquired through donations, the gallery has copyright for approximately 10% of contemporary works.[485] "It's a big-time consuming job to trace all the copyright holders in order to put those images on the internet." Determining the launch date for the virtual permanent collection gallery will largely be a question of manpower.[486]

At Alberta historic sites, data such as "reproduction logs that show us why we made the reproductions that we did and what they were based on," are only preserved in the paper files to which the public has very limited access.[487] Currently the historic sites collections' "database records have very limited information," regrettably including neither digital images nor textual descriptions of the "artifacts that the [display] reproductions are based on."[488] There is, nevertheless, a long-range plan to expand both the database and its accessibility.[489] The "information generated in the data base, will eventually be pulled off into a web site [accessible over the internet and] at the [historic] site if they so choose."[490] Eventually there will be links to it from the current provincial historic sites web pages. Wilkinson would like to see it launched within five years.[491] Though the project will likely be "a continual process to keep fleshing out the artifact records."[492] (Dahl).

The accumulation of data, and even the launching of a live Internet access to it, does not imply any meaningful engagement with the information nor, by

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[485] All 19th and early 20th Century works or earlier become public domain 50 years after the death of the artist, but most of the collection has been acquired since the 1974 opening of the gallery.
[486] Clarke interview.
[487] Dahl interview.
[488] Wilkinson interview.
[489] Wilkinson and a single volunteer are working on the data input as part of their annual inventory of all provincial historic sites, so it looks like a slow evolutionary process. They started two year ago by photographing all artifacts on display at all historic sites. "Last year we took measurements," explained Wilkinson, in a process of adding one more piece of data each year.
[490] Wilkinson interview.
[491] At the time of the interview, this new public-access database website had been under construction for approximately a year (Wilkinson). The "five-year plan" would be just the "basic artifact record, but [regarding all the] background reproduction log information, I don't think that will be on there within that five-year period" (Dahl).
[492] Dahl interview.

itself, add any educational or cultural value to the historic site. It is the design of the interface, the method of access (meta-search data), and the context of the data that has the potential to give it meaning and value. The same thoughtful care taken with the presentation of the artifacts in a gallery display must be taken in the design of the interaction between the user and the digital images, text, metadata, and any modular manipulation activities (such as a fort builder). Edward Tufte persuasively demonstrated that the "juxtapositions" of visual, textual, and contextual data "from the ocean of the streams of story" into what he calls a "visual confection," creates a unique story in itself.[493] How thoroughly the information is researched will determine if it is an honest story. How meaningfully the elements are assembled will determine if it is a valuable story.

3. Museum Website Publication

The development of high-resolution onsite interactive presentations has great potential as a data feeder for the historic division website, virtual museum, or virtual gallery. Though virtual museum sites must currently limit the size of raster images and animations to accommodate rapid Internet download time, there are real benefits of a virtual site complementing the physical site. Just as books about museums and historic sites have encouraged people for centuries to travel to those places, web information today serves as a draw to people interested in history and art. Mack questioned, "Unless you know something about the site, why would you want to visit the site? The more people know, the more likely they actually are to visit the site." From her own experience as a visitor to historic sites, whatever she could learn beforehand not only motivated her travel, but also "made the experience much better" and more meaningful. In her role as Facilities Supervisor of several northern historic sites, Mack interprets the mandate of the provincial historic sites as two-fold: "We exist not only to operate the site, preserving historical and archaeological resources [and] protecting them, but we are also *presenting* them." According to Mack that presentation extends beyond the historic site, to the work of archaeologists, anthropologists, historians, researchers, curators, conservators, collections

[493] Tufte 121.

managers and archivists. "We want to provide the most up to date information. We want to ensure that it is valid, that it has a reputation behind it for accuracy, and what better way to [present that information] than the web?"[494] Investing in the development of a web of digital resources relating to Alberta historic sites would serve both the visitors to the actual sites and on-line visitors to the virtual site.

> Some of our public are the academics, and while they may never physically come out to the site, they are [nevertheless] searching for information about the site. [. . .] The bulk of the studies and reports are unpublished. They remain within our files, but they have never been published, never been distributed, and this is one of the weaknesses of our current system. [. . .] In a time when there might not be money for [conventional] publishing, the web provides you a mechanism [by which] you can [publish] your research reports, make them accessible, [and thereby] feed the profession.[495] (Mack)

Alwynne Beaudoin, Head of the Landscape Studies research division and Curator of Quaternary Environments at the Royal Alberta Museum, is also the manager of the museum's website and electronic outreach program. The museum has published a substantial amount of research online and the reliability of web content is very closely guarded. Recognizing the diversity of opinions even among scholars and experts, and the site's potential as a springboard to other research beyond the museum, Beaudoin is very careful about establishing links to other sites of research groups, but avoids links to biased advocacy groups, and publishes a reliability disclaimer to any sites over which the museum has no content control. The website attracts both local visitors, accessing visitor hours, cafeteria, parking, and admission information, and the web statistics and general queries indicate that the electronic outreach influences a global audience.[496]

Improvements to the Art Gallery of Alberta website seem to be on the agenda of the Executive Director. He suggested that an effective website, which he does not feel the gallery yet has, would "have a significant impact on visitorship and even on membership, much more effective than newsletters

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[494] Mack interview.
[495] Mack interview.
[496] Alwynne Beaudoin, personal interview, 27 June 2006.

which are much more expensive for us." He saw a virtual gallery as "a form of advertising, a form of heightening awareness, giving people access to information about what's here." Speaking from the point of view of the visitor, he asserted that with online computer "access to information on demand, when I want it, but also the quality of that information," much of "which is actually better provided before" arriving at the gallery, "I might be more interested in coming," and if desired, "I can go back after I've seen the work [. . .] and look up that information again."[497]

4. Institutional Resource Rooms

Many museums have designated resource centres or information centres. It allows for the display of in-depth information beyond that of gallery monitors, higher resolution images than website download-speeds make practical, and artworks that copyright restrictions would not allow on the Internet. Any resources prepared for the website can be accessed by visitors to the museum in the resource room, and most resource-room materials can be adapted for web use. The "Artstart" facility has worked so well for the National Gallery in London that it has had to expand into the corridor, foyer, and coffee shop. An "Information Zone" is intended to be part of the Royal Alberta Museum's Project Renewal. Tim Willis, who has seen more than a few resource rooms, and generally considered them "probably very worthy of the expert visitor," noted that too frequently one sees "all these computers sitting idle." From this observation, he drew the conclusion that "the majority of visitors don't really want to explore [the museum's] database."[498] Resource rooms are usually for the minorities who have specific interests and want to delve a little deeper. Idle monitors may also have something to do with the design of the engagement medium through which users interact with the data.

Willis also noted that single-user terminals tend to isolate users from the social experience which is usually an important part of the museum experience. He suggested possibly designing computer stations to accommodate more than

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[497] Luppino interview.
[498] Willis interview.

one person. "A slightly larger screen and a curved bench [. . .] could accommodate two, three, or four people to sit around a computer station, maybe while one person operates it." Willis mentioned a common failure to provide sufficiently frequent seating for visitors. "Maybe if you did provide comfortable seating for a small group located around a computer station you could encourage a small group to interact with it."[499] Mark Steinhilber suggested multiple interfaces would allow for visitors to interact on a single screen.[500]

Resource rooms can also be the ideal place to provide human interaction along with the digital. Because of the limited time curators have to deal directly with the enquiries of visitors, a resource person who may not be an expert in all the fields covered by the museum's collection, but who is very familiar with the digital and other resources, may answer many questions by accessing the digital resources or help visitors access further information on those resources. Steinhilber's plans for the Royal Museum Project Renewal have included discussions on creating a position "like a librarian" through whom all enquiries would be filtered, responded to, or forwarded to the relevant expert.[501]

5. Gallery Displays

Some curators and museum administrators consider digital monitors a distraction. As manager of the museum's web site and electronic outreach program, Alwynne Beaudoin is no technophobe. On the contrary, she places great value on digital resources, but takes a very traditional view of gallery exhibits. She compared placing a wide-screen monitor in a museum gallery to being in a room with a fireplace. "Your eyes go to the fire, and you watch the flames. [Likewise,] if you've got a computer screen in a gallery everybody's eyes go to the computer screen, they don't look at the displays, and they don't look at the exhibits."[502] Both phenomena are common experiences, but unlike the random flickering of flames, well-designed monitor displays have the potential

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[499] Willis interview.
[500] Mark Steinhilber, Head of Life Sciences Division, Royal Alberta Museum, personal interview, 20 June 2006.
[501] Steinhilber interview.
[502] Beaudoin interview.

to redirect attention to specific items in the peripheral view of the most focused screen watcher.[503] As an exhibit designer working closely with curators, Michael Smith initially saw a potential conflict with the use of monitors in the gallery. "There might be a distraction issue with the art and the technology," he noted. In order to avoid conflicts with art-museum curators, his design approach to the graphics for exhibitions was to "keep it subdued, quiet, behind the scenes, not taking over or trying to compete with art work." The design and graphic elements exist "to support the art; and it's really all about the art."[504] The same approach is possible with digital design. Specific visual techniques such as high contrast, vivid colour changes, and flickering or dynamic movement are routinely and deliberately employed in television advertising, music videos, arcade/computer games, and tradeshow computer presentations in order to capture and focus attention to the exclusion of all else. However, screen brightness is easily adjusted to match spotlighted objects in a light-controlled gallery, colour pallet choices can mirror ambient hues and textures, and subtlety can be chosen in lieu of the hard-sell. Digital design can be employed to distract from or to refocus attention on adjacent objects. Most lucky gallery or museum visitors who encounter the temporary distraction of an interesting docent or the rare curator in a gallery are grateful for the added value such a knowledgeable person brings. Computers could offer some of those knowledge resources on a continuing basis.

Mark Steinhilber, Head of Life Sciences at the Royal Alberta Museum, has been seriously evaluating the effectiveness of the computer stations in the existing Wild Alberta Gallery in preparation for Project Renewal. The initial worries about people spending too long on a station were completely unfounded. Rather, there are few people who spend enough time to learn from them, being distracted by all the other things to see all around them. Steinhilber

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[503] The author must confess that, despite my interest in computers as display vehicles, I had enjoyed the exquisitely crafted dioramas and other displays in the Wild Alberta Gallery of the Royal Alberta Museum many times before it was drawn to my attention that there *were* interactive computers scattered through the gallery. I may have subconsciously dismissed them as juvenile, but I do not think I am alone in failing to be impressed by the mere occurrence of a computer in a museum, and my attention is certainly as distractible as the next man's.

[504] Michael Smith, Exhibit Designer, Portland Art Museum, personal interview, 15 May 2006.

suggested larger monitors, clearer communication of what to expect and the purpose of the materials available, and resources that offer subtle but powerful immersion into the material rather than just a collection of images and text, would add value to the exhibit and encourage more interaction and learning.[505]

Beaudoin's objection to computers as distraction raises the issue of a museum's ultimate purpose. The traditional raison d'être of any museum was the value and authenticity of its collection. Beaudoin urged, "What we want people to do is see the *real stuff*, and be inspired by *it* [. . .] to go further and learn more." Her focus was understandably on the artifacts, but she seemed to regard digital presentation intrinsically as competition. She would very much have preferred that a museum visitor remained "in front of an exhibit and looked at it, and *really* looked at it."[506] Digital material is an accompaniment to the artifacts, not a replacement for them. It is not unlikely that some visitors might give the artifact just a cursive glance before turning to the computer monitor, but if it were well designed those visitors could select on that monitor some further information about the artifact that meant something to them, that fired their imaginations, and prompted a more thorough and respectful perusal of the artifact. Then they might "*really* look at it." The ultimate purpose of a museum is more than simply exposing visitors to the passive view of authentic art or artifacts. Museum visitors should engage, experience, and learn enough at a gallery, museum, or historic site so that they came from each experience with some new reason to ascribe value to the "real stuff" in the collection and, by extension, to the museum and what it does. An exhibit device that can tailor display information to different ages, learning styles, interests, and backgrounds would improve the chances of achieving that goal.

The very flexibility of the digital medium has been questioned as a challenge to the institutional authority of museums and the curatorial expertise of their staff. The Art Gallery of Alberta Executive Director feared that digital interaction in an art gallery might offer "too much choice. It can become not misdirected but

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[505] Steinhilber interview.
[506] Beaudoin interview, the italics reflect the vocal emphasis of the interviewee.

undirected. One of the things people want is some *direction*. They come to a museum to see [an exhibition] because they want us to give them some *direction*." In his view, power over the display information should be the exclusive province of the experts. "In a curated exhibition," he insisted, "the information is part of the experience, and *control* of the information is *important* to that experience." According to Luppino, if the curator was "doing his job" the gallery patron's experience of the exhibition would compare to the reading of "a novel," in which "footnotes" are not only unnecessary but "interrupts the narrative." The audience may choose to read the information choices made by a qualified author or choose to put the book down, but may not select more or alternative information.[507]

Luppino raised a number of important concerns, including the need for direction and narrative flow. No doubt most gallery visitors do appreciate some guidance, but the research suggests that informal learning needs to be less rigidly structured to attract leisure audiences. As totally pre-structured narrative entertainment, the gallery or museum does not compete well statistically with the cinema. Museums can offer an alternative to passive packaged leisure diversions. The narrative is a useful metaphor in the design of exhibits, but perhaps, without departing from the book-oriented social epistemology, a well-written reference text might actually be a more appropriate archetype for the modern museum, including metaphorical footnotes or other annotations. Art and artifacts have stories to tell, but their stories are interwoven with each other and with the stories of the people and cultures that created and preserved them. There is no one story to which all visitors relate. To tell only one story severely limits the potential audience appreciation. His last concern was the control of information. Authoritative control of information is not eliminated but expanded by the choices of digital interaction. As Michael Smith observed, "It would create multiple exhibitions within one exhibition essentially. You could tell the history of things or the connectivity between different artists or regions and get more in-depth information."[508]

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[507] Luppino interview, the italics reflect the vocal emphasis of the interviewee.
[508] M. Smith interview.

The necessity of creating these alternative information threads raised questions for Marcus Miller about the real interactive nature of digital resources. Miller, Assistant Curator and Public Programs Manager at the Art Gallery of Alberta, responsible for curating local artists into the gallery, arranging artist lectures, and ancillary programs to the exhibitions, was interested in digital interactivity, but even more in human interactivity in the gallery. Though skeptical about the introduction of computer interaction in a gallery, he could see some real advantages to the flexibility of flat-screen monitors accompanying or even in lieu of printed didactic panels.

> If we have flat screens up there instead of our printed stuff, we could sort of change things, we could have three or five channels lets say, and [visitors] could print out [their] own kind of little catalogue [. . .] the possibilities are truly wonderful. But I would say [. . .] the display, no matter how well it is designed, is not really interactive because it's all pre-programmed. We can give you seven different angles on this painting, but they're all preprogrammed and they're all fixed, every bit as fixed as our printed panel up there right now. I like the fact that we would have maybe more perspectives than that, that really sounds interesting, but even better, I'd like you to come here and bring people in yourself and talk about it in the flesh. [. . .] That's interaction![509]

Jack Brink could tell stories that would add meaning and value to every artifact in the Royal Alberta Museum archaeological collection.

> I can take people up there and tell them a story [. . .] and they'll be spellbound to understand all that went into a prehistoric hunting situation, when these people had none of the things we have today. It's the story behind [the artifact] that will grab them, not often the piece [itself]. If I could live up there 24 hours a day I think our gallery would be pretty successful, but I can't and I wouldn't, so anything we can do to help tell that story is going to be in our favor. I think [the digital alternative] is going to make people walk out of there with a greater appreciation for what the past means and why it's important.[510]

There is no question that a knowledgeable and enthusiastic person would be the ideal interactive experience in every museum gallery, but curators have other things to do all day and really good volunteer docents are hard to find.

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[509] Marcus Miller, personal interview, 6 July 2006.
[510] Brink interview.

6. Monitor Faces and Interfaces

"We are an educational facility and you are offering more information – I think it's a wonderful idea, and implemented correctly and designed well [. . .] it could be great!"[511] This was the conclusion of display designer Michael Smith after discussing the potential advantages and disadvantages of the use of digital technology in the context of the galleries of an art museum. Crucial to the idea is implementation and design. "Using it badly is the greatest danger," Director Luppino wisely cautioned at the conclusion of his interview. Both had mixed feelings and some trepidation because of previous experiences with computer kiosks in art museums.

Luppino observed that in his experience a digital information kiosk offering more works by artists in the collection "doesn't get used much." His explanation was that the information was "isolated from the work" and that gallery patrons in search of understanding want to see the explanation "next to the painting." Ironically, he was reluctant to place monitors in the gallery next to the art, certain that computers don't integrate into an exhibition like "wall signage." His experience with bulky kiosks and the large tube-screen monitor on his desk seemed to make it difficult for him to conceive of flat-screens integrated into the gallery architecture essentially like wall signage. He recognised "the biggest challenge is how to integrate that," but acknowledged that if one were to "curatorially and conceptually build that in you might have a better chance."[512] Wide-screen, high-resolution, flat, touch-screen monitors eliminate the mouse, keyboard, and bulky physical presence of office computers that has made them visually incompatible with gallery design. The positive experience of curators and visitors at the Victoria and Albert Museum attest that it can be done well.

A history of maintenance headaches was Smith's memory of the information kiosk in the foyer of the Portland Museum of Art during the north building expansion project a few years ago. The problem was not the idea but the level of technological available at the time.[513] Frustrations result from "computers

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[511] M. Smith interview.
[512] Luppino interview.
[513] M. Smith interview.

breaking down. If that is your primary method of getting that information across and the computer is not working, the visitors don't have access to it."[514] With more than one computer available to visitors, there is at least the chance of having a functional interface. Interpreters and docents also get sick, and therefore there are more than one hired or scheduled so there is a backup. Often computers are frozen or off due to very minor overloads or temporary electronic glitches. A backup server could be programmed to monitor the visitor computer stations, detect a frozen screen after a specified period of inactivity, shut down the computer, and reboot. It could also regularly wipe networked computer drives at night, and reinstall the software programs and data before morning, as is customary in university computer labs, though the menu-format touch-screen interface avoids many of the opportunities for deliberate or accidental tampering with the programs and data installed. There would have to be a plan for the rapid replacement of a seriously damaged computer, which could be managed by the interpretive staff or a local technician.

Incorporating monitors into overall design elements of a given display will mean giving attention to space, visual tension, movement, unity, balance, and focus. Temporary exhibits may not justify the expenditure of time and resources to create extensive digital accompaniments, but traveling exhibits might incorporate digital interactivity as part of the display design. For very subtle designs, the innovations of Sony e-paper and e-readers offer a digital alternative to the illuminated screen monitor, allowing the computer to display type or line art on the reflective surface appearance of virtual paper.[515]

Digital monitors should serve to augment text panels, labels, and signage. They may carry supportive illustrative material, audio-visual components, general associative information, alternative narratives, and offer a taste of the in-depth resources available in the resource-room or online. If idle, the computer would be programmed to automatically return to the descriptive information of

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[514] Dahl interview.

[515] Black and white text and images are comparable to laser printing. Prototype colour-image e-readers have been developed but the coarseness of the images and limited pallet suggests very limited application at this stage of development.
<http://en.wikipedia.org/wiki/Electronic_paper>

the art or artifacts on display around it, but could be activated by touch, to display more information to the interested viewer in a variety of possible hyperlink directions. This information could include enlargements, sections, x-ray or infrared revelations of the subsurface, contextual diagrams, photographs of artifacts not on display, or virtual 3-D reconstructions. This digital material may mirror that available to the virtual visitor to the virtual museum website, however, instead of web pages designed for rapid download to the most common low-resolution smaller-screen personal computers of the average "net surfer" (as is the usual rule in user-friendly web design), it could exploit the full graphic display capacity of the museum's state-of-the-art monitors and local-server image retrieval. A local network within a museum could also guide the visitor to other displays in the museum related thematically by artist, era, material, culture, or any number of appropriate criteria. Gallery display monitors would necessarily be more limited than resource room computers. Even those should serve the museum's mission rather than providing e-mail or random surfing access for visitors.

The flexibility of the digital interface affords the display designer the opportunity to offer potential visitors not only a range of different levels of information but also a range of presentation methods between which they may choose. "If you want to attract visitors, you want to get at them as many ways as you possibly can," said Mack. "What the computer often gives us is an easier ability to deal with different learning styles."[516] Some people are visual learners, others relate primarily to text, while still others need to interact aggressively with material for learning to take place. The designer can choose to pass some of the array of interface possibilities on to the user to accommodate differences in age, background, learning style, motivation and time restraints. Cascading Style Sheets allow the interface to accommodate the preferences of the user. Giving the user choices also contributes to the value often subconsciously assigned to the thing chosen. In order to create a meaningful experience for potential users, however, each of the user's various possible choices must be thoughtfully and

[516] Mack interview.

carefully designed to create a valuable and engaging visual confection, not just an exposure to information.

7. Resources

The most significant challenge is neither the investment in software nor hardware. It is the investment in personnel. "The computer is not what is important," Mack asserted. "It is [merely] the medium or mechanism for getting across the message." The real issue is the ongoing investment in the people who create that message. Telling the story requires the ongoing collaborative work of researchers, historians, archaeologists, curators, collections managers, and conservators in creating the content, as well as the digital developers, designers, writers and programmers in creating an engaging and meaningful expression of that content. Many museums have historical researchers, curators, and conservators. What most lack is the technical and design personnel to effectively present the accumulating research data in digital form, to build, maintain, and expand the information resources. Stable funding needs to be in place to support that process.

Duguay recognised the biggest challenge would be a "manpower" issue, but from a different angle. "We've gone higher tech and done more [audiovisual] displays and that sort of thing, partly in reaction to the fact that we have less and less [human] resources to interpret the story," he observed. "But the higher tech you go in trying to deliver that story, the more problems you have, and then it becomes an issue of how do you maintain it?" Duguay sees the current fiscal limitations to technical maintenance staff funding as a major challenge.[517] There will always be a need for competent support technicians, but for some of the reasons discussed above, and because of industry research and development trends toward more robust hardware and self-diagnostic/self-repair software, there exists a more significant needed investment in creative personnel. It will matter little how well the vehicle functions if the content is neither engaging nor meaningful.

[517] Duguay interview.

There remain two sides to the implementation of interactive computers in a museum. From the practical view of an exhibit designer, on one hand "it adds depth to the information you can offer to the audience that comes to the exhibitions, [. . .] we could bring it to the web, [. . .] and offer more information in a resource room," but on the other hand "would be the amount of effort [. . .] that would go into [the digital elements] designing that, as well as working on the [physical] exhibition and [. . .] designing for that."[518] It would mean more work for the existing curatorial and design staff as well as dedicated digital-design staff. Weighing it that way, the question is, how far are museums willing to go in the service of society?

It must also be weighed in budgetary terms. From a fiscal administrator's view, Ron Gregg has some doubts about the dividends in relation to the investment for every show. "Obviously there's people time, there's obviously dollar outlay," some of which he saw as necessary anyway, but to get the database information in a digital format to do the job,[519] install the hardware, design the interfaces, and incorporate all the items would be extra. "To get someone to spend an extra 10 minutes on a piece of art, you'd probably have to have 30 different items within that computer that pertain to that one specific artist." Questioning whether any temporary show could afford it, Gregg judged that "from our perspective I think it would be prohibitive." On the other hand, asked if it would be worth it to invest that kind of effort, time, and money into the permanent collection, he thought "it probably would."[520]

8. Can We Afford Not To?

The investment in hardware, software, technical and design manpower will be substantial, but the statisticians at Statistics Canada suggest there is reason to predict that such investment in interactive information resources will ultimately

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[518] M. Smith interview.

[519] Gregg suggested he might reconsider "if there was something where Canadian Heritage or something on a more global scale, [. . .] could get away from all those copyright issues so that this information would be more readily available and [. . .] then, if all you needed [were] someone who is really comfortable with a computer, say a graphics type person just to put it all together.

[520] Gregg interview.

pay off in increased visitation to and use of the facilities in which such investment is made. Canadian culture is both an issue of economy and identity. In the *Canadian Culture in Perspective: A Statistical Overview*, Statistics Canada defines culture to include five sub-sectors: "cultural industries," "arts (performing arts, visual arts, crafts, architecture, photography, design, and advertising)," "heritage," "libraries," and "other cultural activities (fine arts education, festivals, and government activities)." The perspective in which the Canadian culture is viewed by this report is economic. As an economic sector, it makes a $22.5 billion direct impact on the gross national product, which translates into 3.11% of the total Canadian economy. Though the heritage sub-sector is a fraction of that total, it contributes $1.3 billion to our economy.[521] Attendance trends at heritage institutions in the 1990s showed a 5% decrease overall but museums showed a 6% increase, attributed to the attraction of multimedia, multidisciplinary imagery accompanying the objects on exhibit.[522] Recognizing a clear correspondence between the investment in exhibit technology and the rise in museum patronage and revenues, the report recommends the increased use of "technology to reach audiences through their exhibits and on the Internet" in order to increase revenues through attracting larger audiences."[523]

On another level, can we afford to ignore the changes in social epistemology through which our culture is passing, and risk becoming perceived by some as obsolete or irrelevant to future society as the Library of Alexandria became to the Caliph in Cairo or as Gothic art to post-Renaissance literati? The obligation museums have to the public trust is to maintain the value and accessibility of their collections and exhibitions by "using whatever technologies and programming techniques are available."[524]

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[521] Statistics Canada, *Canadian Culture in Perspective: A Statistical Overview*, Ottawa: StatCan, 22 Dec. 2000: 15, 19 Nov. 2005 <http://dsp-psd.communications.gc.ca.login.ezproxy.library.ualberta. ca/collection-R/Statcan/87-211-XIB/87-211-XIB-e.html>.

[522] StatCan *Culture* 74.

[523] StatCan Culture 76.

[524] *Challenges and Choices: Federal policy and program proposals for Canadian museums,* (Ottawa: Minister of Supply and Services Canada, 1988, 10) qtd. In D. Smith 217-218.

IV
CONCLUSION

This exploration has revealed the dynamic changes in attitudes toward and perceptions of museums. Though their role is changing, the continuity they contribute is important. Both change and contribution are captured in the introduction to *Project Renewal* by Dr. W. Bruce McGillivray, Director of the Royal Alberta Museum.

> Museums are changing around the globe. Increasingly they are vital educational and community resources – an opportunity for users to be engaged and enriched [. . .] Museum's matter [. . .] They touch people's lives and enrich our quality of life [. . .] They are a forum for the exchange of ideas [. . .] They embrace exploration, discovery, wonder, and dialogue in ways that allow us to understand and engage the world around us.[525]

That understanding and engagement is reflected not only in the content of museums but in their delivery. An important question about that delivery is whether computer technology has a place in arts museums. It has. That place is not as an artifact, displaying all of which the latest digital technology is capable, although there is a place in science and technology museums for that demonstration. The place of computer technology in art galleries, art and history museums, and historic sites is as a communications medium, adding visitor engagement and value to the collections of art and artifacts on display. It is the best tool for the job, and the development of current monitors makes it an even more versatile tool for smooth integration into display design.

The differences noted between the first and second editions of Alberta's *Standard Practices Handbook for Museums* in the interpretations and emphases of the international definition of museums mirrors Peter Welsh's analysis of museological shifts in American Museums. The shift from a focus on collections to a focus on the public opens the museum to many non-traditional exhibition techniques and styles, especially to taking greater advantage of computer technology as a medium of display and meaning making. Not only does computer technology have a place in arts museums, it has three: gallery,

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[525] *Project Renewal: Royal Alberta Museum,* Renewal Mediakit.pdf: 2, accessed 5 February 2007 <http://www.royalalbertamuseum.ca/renewal/_pdf/mediakit.pdf>.

resource room, and website. The resource room and the website offer unprecedented opportunities for information dissemination, but the gallery offers the immediacy of proximity to actual art and artifacts. The digital resources are given tangible value by their juxtaposition with the treasured remnants of cultures and civilization. In return, the information and images on the monitor give added context, meaning, and value to the art and artifacts they accompany. Their synthesis makes each more powerful and more valuable. This is especially true for historical art and artifacts, which demand greater contextual substantiation for meaning making and value appreciation as the changing social values and technology of modern society increasingly separate people from the heritage of their past. The appropriateness of the digital medium to inform and enhance the museum experience increases in the context of our society's inexorable shift from the book to the digital social epistemology.

Museum collections benefit from more than the many conservation analysis and data management techniques made possible through digital technology. Though there are times when conservation necessitates intervention, the trend toward nonintervention and restoration from previous restorations is offset by the freedom of digital technology to offer alternatives. Cleanings, restorations, and reconstructions can be made without permanent alteration to the original art, artifacts, or site. Differing opinions of experts can be explored, compared, and presented digitally to interested museum visitors. Virtual tours can make fixed artworks and architecture accessible to a global audience and digital educational resources are able to make the study of art history more radiantly available than ever before. Humanities Computing projects are publishing more, allowing museum visitors a far richer spectrum of interactive resources.

Curators around the world have taken advantage of computer technologies in a wide variety of ways. The Victoria and Albert Museum in London has been especially successful in offering digital interaction in art and historical galleries as well as resource rooms. Alberta museums have not taken full advantage of this powerful communications tool, as the combinations of traditional museological philosophy and practice, as well as a few bad experiences with premature

implementations of earlier technology have prejudiced some. Others, who have caught the vision of digital potentialities and enhanced visitor engagement, have been constrained by budget, time, copyright, and especially skilled manpower limitations.

The three heritage institutions briefly profiled are representative of a wide spectrum of arts and humanities museums that could potentially benefit from more fully exploring and exploiting digital resource development and integration into the museum-visitor experience. All three have much more information that some of their audience would like to access. Some of that information is in databases and files that need to be developed for greater utility. They each have a web presence but more resources need to be allocated to development of that resource, and expanded for resource rooms. Gallery use of large, flat, touch-screen monitors will have the greatest impact because of their immediacy to the objects and art on display. Modern style developments have made these monitors more adaptable to gallery and exhibition design. Digital technology can be a medium to create value by adding meaningful engagement to cultural experiences. The investment in such resources may not be fully recoverable with increased earnings from sales and fees, but may be a leading factor in preserving the value of cultural heritage and cultural-heritage institutions in the minds and hearts of present and future society. It will bring museums closer to the lofty aspirations in David Anderson's visionary definition of a museum.

> Museums at their finest are universal educational institutions of immense expressive power and authority. They communicate with us across boundaries of language, culture and time, and suggest comparisons which illuminate our experience of the present. The objects and works of art which they hold embody the ways of life, ideas, values and spirit of those who created them. Through museums, we have direct contact with peoples of all ages and cultures, experience the unimaginable variety of the natural world, and expand our understanding of what it is to be human.[526]

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[526] David Anderson, *A Common Wealth: Museums and Learning in the United Kingdom* (London: Department of national Heritage, 1997) xii, qtd. in Hayward 29.

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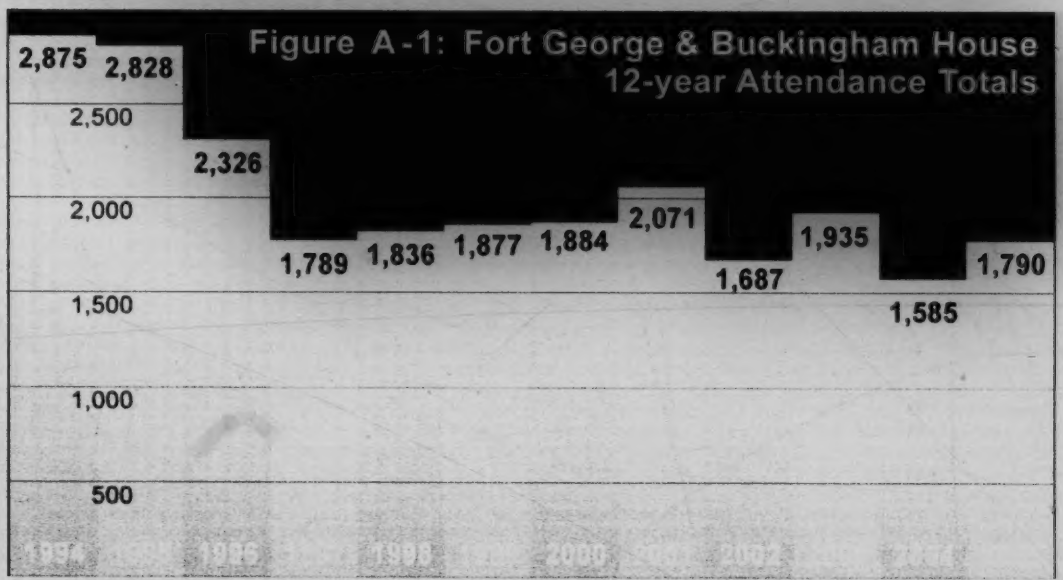
APPENDIX A

The following figure is derived from the *Attendance Totals* report of the Cultural Facilities and Historical Resources Division, Alberta Community Development, 2006.



The following figure is derived from the *Daily/Monthly Visitation Record* report of the Cultural Facilities and Historical Resources Division, Alberta Community Development, 2006.

Fort George and Buckingham House daily visitors from May 15 through September 5, 2005
Educational groups (red bars) include students, teachers, bus drivers, parents and other assistants

The following figures are derived from a comparison of the *Heritage Facilities Visitor Survey* reports for *2005, 2004, 2003, 2002, 2001* and *2000*, each published internally the following year by the Cultural Facilities and Historical Resources Division, Alberta Community Development.

Figure A-3: FG&BH visitor origins 2000-2005

Figure A-4: Number of members per group FG&BH 2000-2005 visitor averages

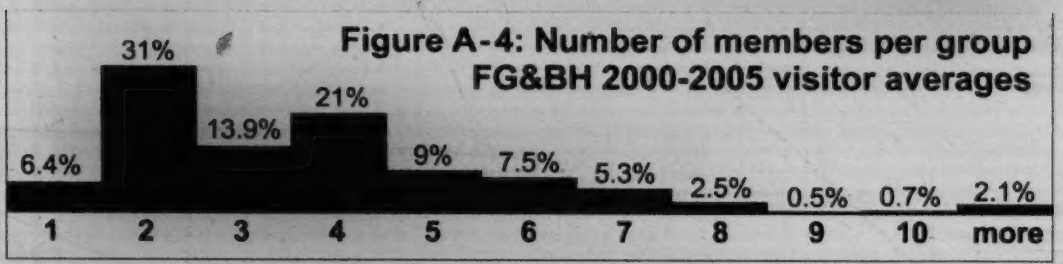


Figure A-5: Age of FG&BH visitors 2000-2005 averages					
under 7	7-17	18-34	35-49	50-64	over 65
10.6%	**19.5%**	**11.7%**	**23.2%**	**19.1%**	**16.0%**

Figure A-6: Group composition, FG&BH 2000-2005 averages

45.3% included children			**11.2%**	**12.7%**	**29.8%**
6.3% young families	27.4% mixed families	11.6% older families	**young adults**	**mixed adults**	**mature adults**

Figure A-7: Main purpose for visiting FG&BH area 2000-2005					
1. a "short getaway or daytrip" **29.5%**	2. "to visit this facility or attend an event at the facility" **17.3%**	3. "to visit friends and family in the area" **16.8%**	4. part of a "long vacation" **11.8%**	5. "just passing through" **10.5%**	6. show friends and family around 7. business meeting 8. other 9. personal errands 10. sporting event **14.1%**

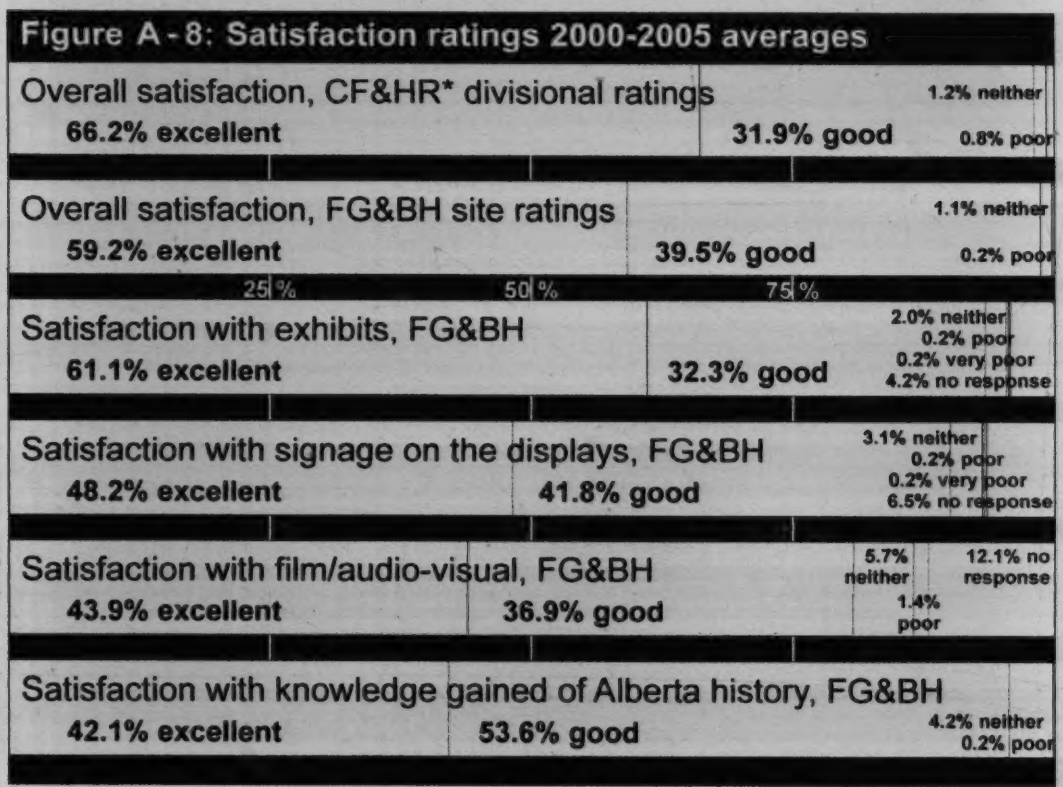
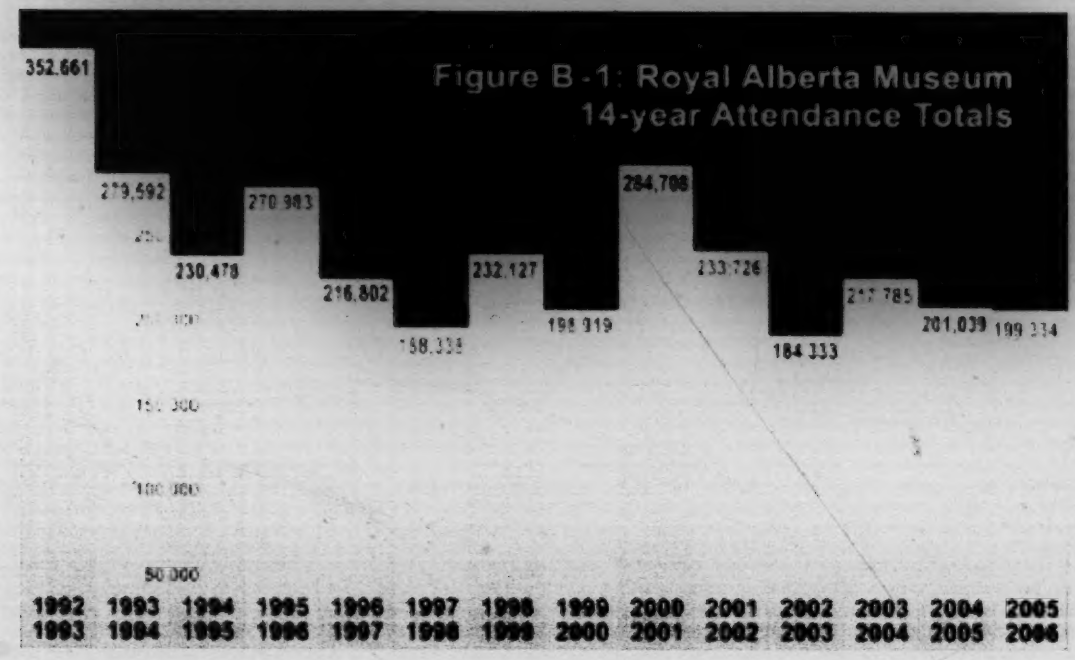


Figure A - 8: Satisfaction ratings 2000-2005 averages
Overall satisfaction, CF&HR* divisional ratings
66.2% excellent
31.9% good
1.2% neither
0.8% poor
Overall satisfaction, FG&BH site ratings
59.2% excellent
39.5% good
1.1% neither
0.2% poor
25 %
50 %
75 %
Satisfaction with exhibits, FG&BH
61.1% excellent
32.3% good
2.0% neither
0.2% poor
0.2% very poor
4.2% no response
Satisfaction with signage on the displays, FG&BH
48.2% excellent
41.8% good
3.1% neither
0.2% poor
0.2% very poor
6.5% no response
Satisfaction with film/audio-visual, FG&BH
43.9% excellent
36.9% good
5.7% neither
1.4% poor
12.1% no response
Satisfaction with knowledge gained of Alberta history, FG&BH
42.1% excellent
53.6% good
4.2% neither
0.2% poor

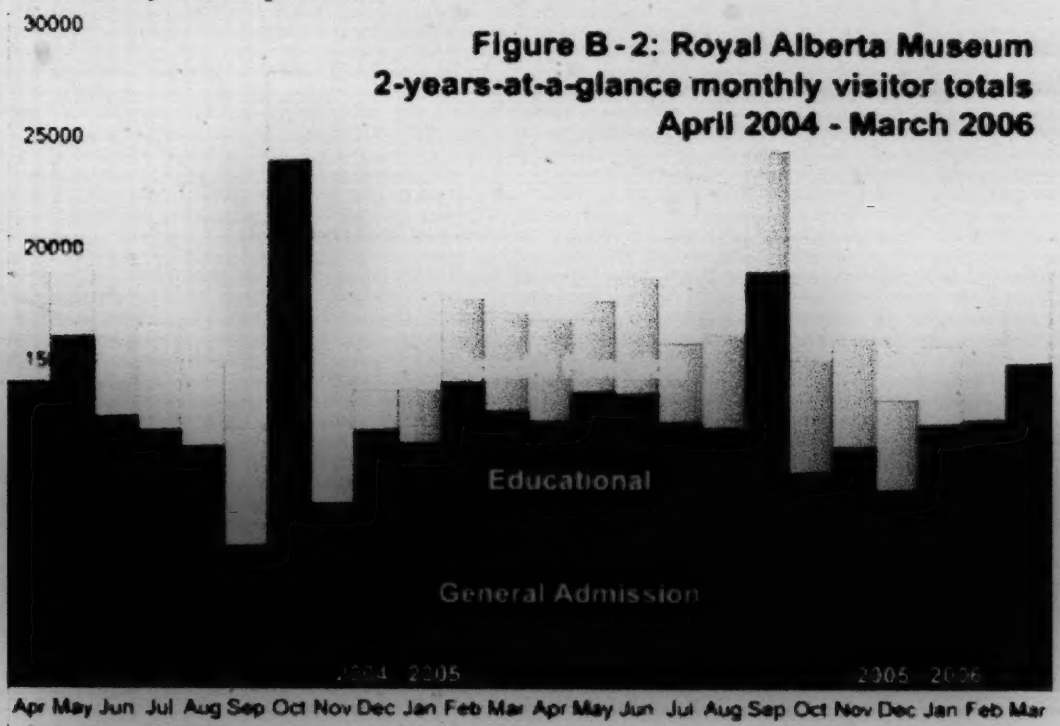
APPENDIX B

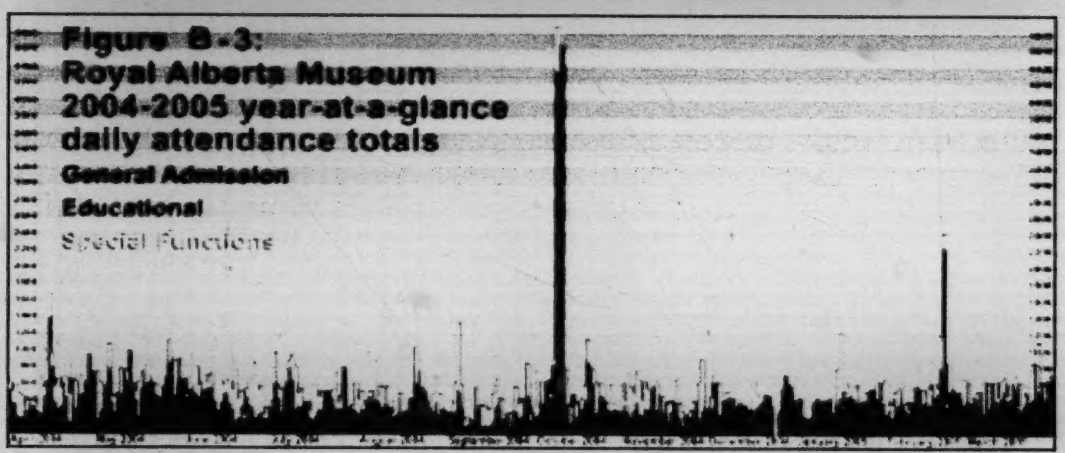
The following figure is derived from the *Attendance Totals* report of the Cultural Facilities and Historical Resources Division, Alberta Community Development, 2006.

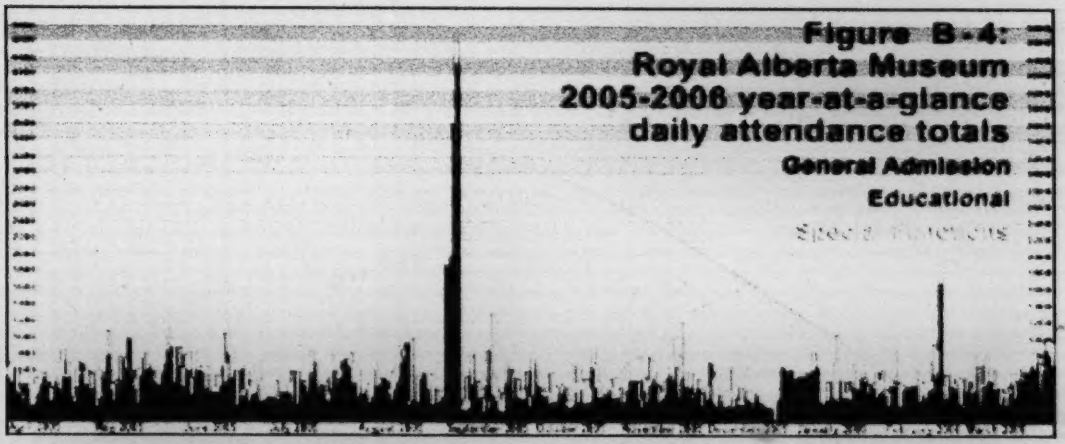


The following figures are derived from the *Daily/Monthly Visitation Record* report of the Cultural Facilities and Historical Resources Division, Alberta Community Development, 2006.

Figure B-2: Royal Alberta Museum
2-years-at-a-glance monthly visitor totals
April 2004 - March 2006


30000
25000
20000
Educational
General Admission
2004 2005
2005 2006
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar





The following figures are derived from a comparison of the *Heritage Facilities Visitor Survey* reports for *2005, 2004, 2003, 2002, 2001* and *2000*, each published internally the following year by the Cultural Facilities and Historical Resources Division, Alberta Community Development.

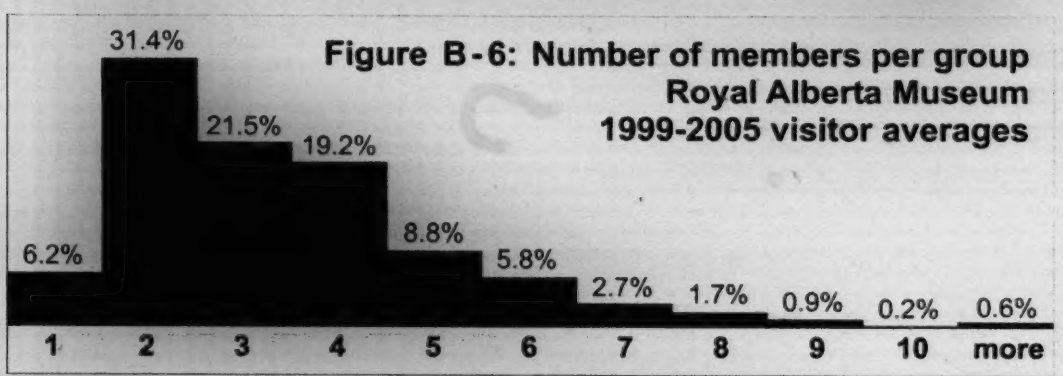


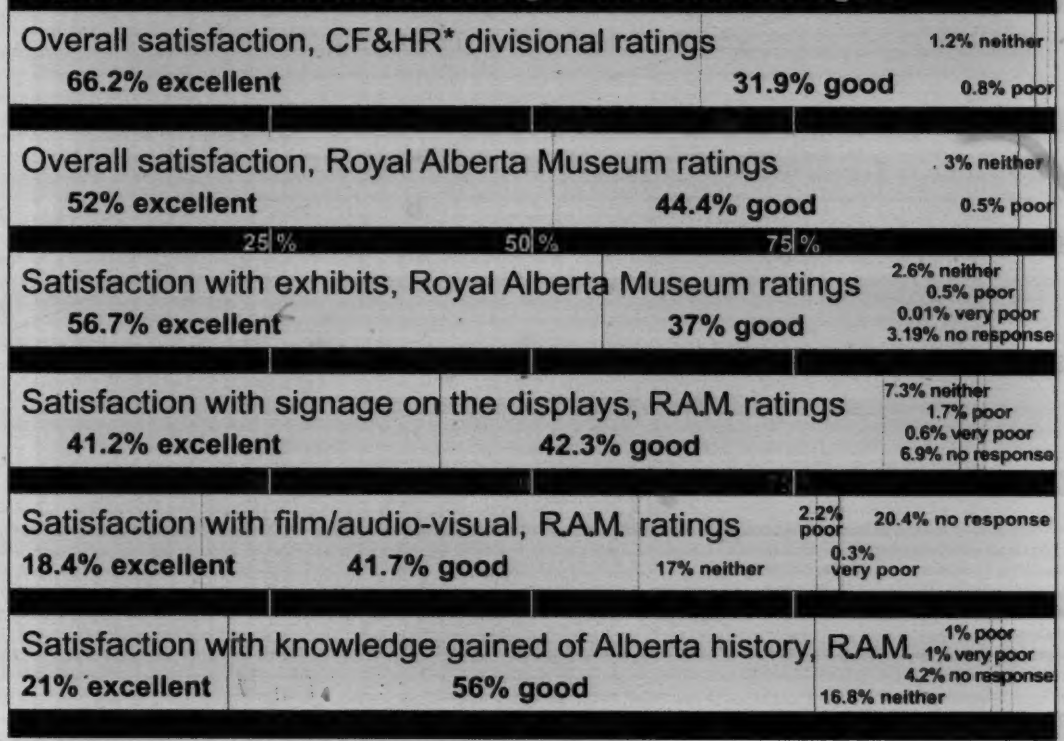
Figure B-7: Age of R.A.M. visitors 1999-2005 averages					
under 7	7-17	18-34	35-49	50-64	over 65
15.4%	**18.5%**	**19.5%**	**24%**	**13%**	**9.5%**

52.9% included children			18.1%	10.1%	16%	2.9% no response
15.3% young families	24.5% mixed families	13.1% older families	young adults	mixed adults	mature adults	

Figure B-9: Main purpose for visiting R.A.M. area 1999-2005

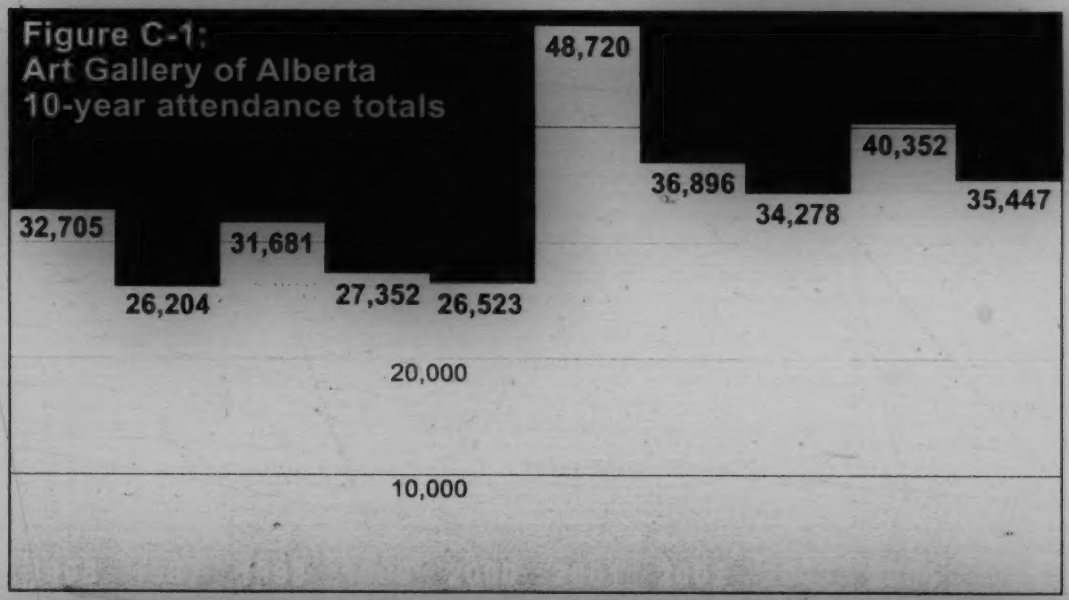
1. "to visit friends and family in the area" **38.6%**	2. "to visit this facility or attend an event at the facility" **15.4%**	3. a "short getaway or daytrip" **14.5%**	4. part of a "long vacation" **14.1%**	5. personal errands 6. business meeting 7. show friends around 8. passing through 9. sporting event 10. other **17.4%**

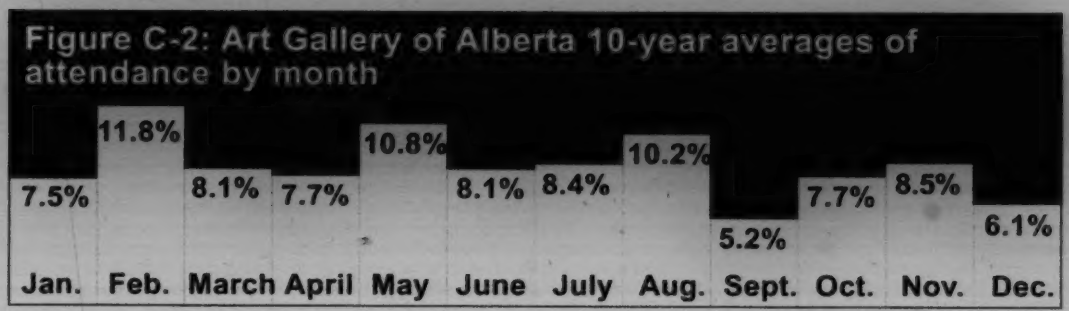
Figure B-10: Satisfaction ratings 1999-2005 averages



APPENDIX C

The following figures are derived from the *EAG Attendance Data* and *Comparison Attendance Numbers* tables from the December attendance summary Excel documents of the Edmonton Art Gallery, 2001 through 2005, provided by Ron Gregg in an e-mail to the author, 11 July 2006.





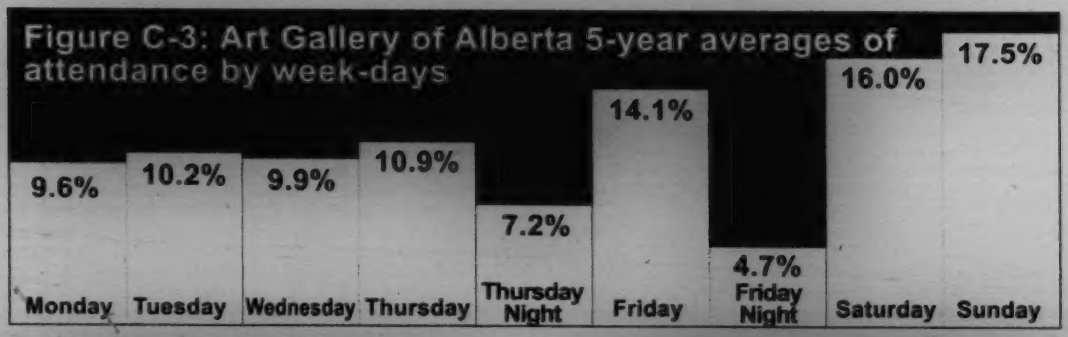


Figure C-3: Art Gallery of Alberta 5-year averages of attendance by week-days
9.6%
10.2%
9.9%
10.9%
7.2%
14.1%
4.7%
16.0%
17.5%
Monday
Tuesday
Wednesday
Thursday
Thursday Night
Friday
Friday Night
Saturday
Sunday

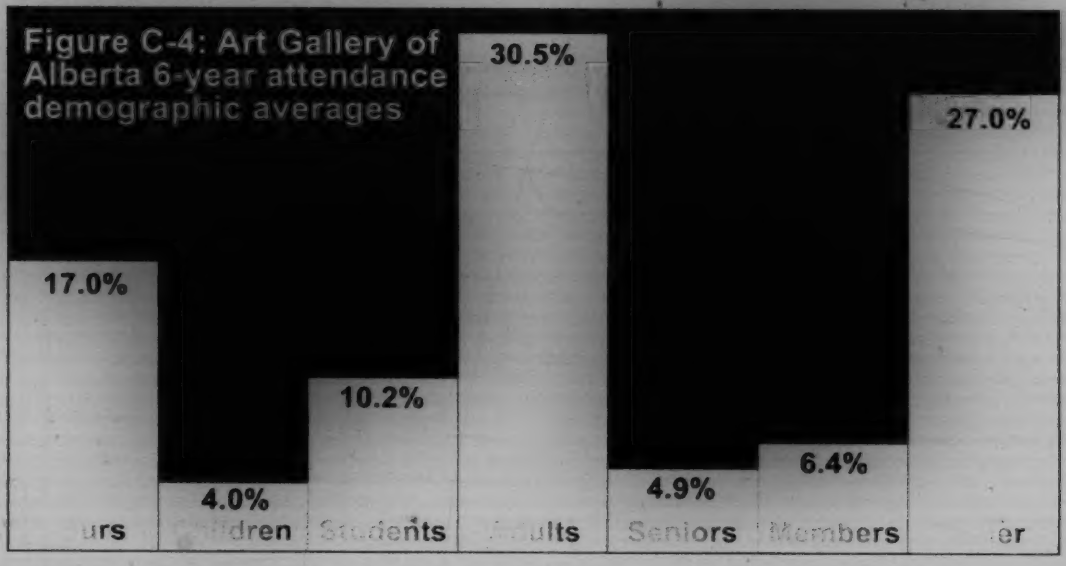


Figure C-4: Art Gallery of Alberta 6-year attendance demographic averages
17.0%
4.0%
10.2%
30.5%
4.9%
6.4%
27.0%
Students
Seniors
Members

APPENDIX D

The following tables are derived from the survey data provided by Statistics Canada through the "e-stats" portal of the University of Alberta Data Library. All tables included in this appendix were created from the raw data in the *1998 General Social Survey, Cycle 12, Time Use Survey*. The figures in the tables have been adjusted to compensate for the statistical variance between the demographic distributions of the 10,749-respondent sample and the 20,260,137-person population of which they are a sample. For example the number of full-time students who participated in the survey was disproportionately higher than in the total Canadian population, so their responses are statistically weighted slightly less.

Table 1: "H12 – During the past 12 months, did you access the Internet for reasons other than paid work or studies?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	7170933	29.6	32.1	32.1
	2 No	15180166	62.6	67.9	100.0
	Total	22351099	92.1	100.0	
Missing	8 Don't know	26109	.1		
	9 Not stated	1882928	7.8		
	Total	1909037	7.9		
Total		24260137	100.0		

Table 2: "H12A – When you accessed the Internet, was it to communicate (via e-mail, chat group, live conference, video phone, etc.)?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	5478367	22.6	76.4	76.4
	2 No	1692566	7.0	23.6	100.0
	Total	7170933	29.6	100.0	
Missing	7 Not asked	17089203	70.4		
Total		24260137	100.0		

Table 3: "H12B – When you accessed the Internet, was it to do research?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	5412279	22.3	75.5	75.5
	2 No	1758654	7.2	24.5	100.0
	Total	7170933	29.6	100.0	
Missing	7 Not asked	17089203	70.4		
Total		24260137	100.0		

Table 4: "H12E – When you accessed the Internet, was it to view works of art (e.g., paintings, sculpture, photographs) or to view museums or other similar collections?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	1011123	4.2	14.1	14.1
	2 No	6158765	25.4	85.9	100.0
	Total	7169888	29.6	100.0	
Missing	7 Not asked	17089203	70.4		
	8 Don't know	1046	.0		
	Total	17090249	70.4		
Total		24260137	100.0		

Table 5: "H27 – During the past 12 months did you go to a museum, science centre or art gallery?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	7210446	29.7	32.3	32.3
	2 No	15121617	62.3	67.7	100.0
	Total	22332063	92.1	100.0	
Missing	8 Don't know	37702	.2		
	9 Not stated	1890371	7.8		
	Total	1928073	7.9		
Total		24260137	100.0		

Table 6: "H28 – Did you go to a to a public art gallery or art museum (including special art exhibits)?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	5363772	22.1	74.5	74.5
	2 No	1839059	7.6	25.5	100.0
	Total	7202831	29.7	100.0	
Missing	7 Not asked	17049691	70.3		
	8 Don't know	7615	.0		
	Total	17057305	70.3		
Total		24260137	100.0		

Table 7: "H28A – How often did you go to a public art gallery or museum?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 1 to 4 ts a year	4711235	19.4	88.0	88.0
	2 5 or morry month	448726	1.8	8.4	96.4
	3 At leastry month	194632	.8	3.6	100.0
	Total	5354592	22.1	100.0	
Missing	7 Not asked	18896364	77.9		
	8 Don't know	9180	.0		
	Total	18905545	77.9		
Total		24260137	100.0		

Table 8: "H30 – Did you go to a science centre or science museum, or a natural history or natural science museum?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	3128252	12.9	43.5	43.5
	2 No	4065018	16.8	56.5	100.0
	Total	7193271	29.7	100.0	
Missing	7 Not asked	17049691	70.3		
	8 Don't know	15735	.1		
	9 Not stated	1440	.0		
	Total	17066866	70.3		
Total		24260137	100.0		

Table 9: "H30A – How often did you go to a science centre or science museum?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 1 to 4 ts a year	2943332	12.1	94.2	94.2
	2 5 or morry month	117720	.5	3.8	98.0
	3 At leastry month	63717	.3	2.0	100.0
	Total	3124769	12.9	100.0	
Missing	7 Not asked	21131884	87.1		
	8 Don't know	3483	.0		
	Total	21135368	87.1		
Total		24260137	100.0		

Table 10: "H31 –Did you go to a general, human history or community museum?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	2636570	10.9	36.7	36.7
	2 No	4556154	18.8	63.3	100.0
	Total	7192724	29.6	100.0	
Missing	7 Not asked	17049691	70.3		
	8 Don't know	16282	.1		
	9 Not stated	1440	.0		
	Total	17067412	70.4		
Total		24260137	100.0		

Table 11: "H31A – How often did you go to a general, human history or community museum?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 1 to 4 ts a year	2472823	10.2	93.8	93.8
	2 5 or morry month	104658	.4	4.0	97.8
	3 At leastry month	58470	.2	2.2	100.0
	Total	2635951	10.9	100.0	
Missing	7 Not asked	21623566	89.1		
	8 Don't know	620	.0		
	Total	21624186	89.1		
Total		24260137	100.0		

Table 12: "H32 – During the past 12 months did you go to an historic site?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	7862664	32.4	35.2	35.2
	2 No	14451217	59.6	64.8	100.0
	Total	22313881	92.0	100.0	
Missing	8 Don't know	61505	.3		
	9 Not stated	1884751	7.8		
	Total	1946256	8.0		
Total		24260137	100.0		

Table 13: "H32A – How often did you go to an historic site?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 1 to 4 ts a year	6771922	27.9	86.2	86.2
	2 5 or more times	1086499	4.5	13.8	100.0
	Total	7858420	32.4	100.0	
Missing	7 Not asked	16397473	67.6		
	8 Don't know	4243	.0		
	Total	16401716	67.6		
Total		24260137	100.0		

Table 14: Visitors to either an historic site or a museum within the previous 12 months (combined data for tables 5 and 12).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Yes	10432264	43.0	46.7	46.7
	2 No	11893860	49.0	53.3	100.0
	Total	22326125	92.0	100.0	
Missing	System	1934012	8.0		
Total		24260137	100.0		

Table 15: Visitors to either an historic site or a museum, differentiated by gender.

			SEX Sex of respondent.		
			1 Male	2 Female	Total
histcult Visited either an historic site or a museum	1 Yes	Count	5217090	5215174	10432264
		% within SEX Sex of respondent.	47.4%	46.1%	46.7%
	2 No	Count	5796703	6097157	11893860
		% within SEX Sex of respondent.	52.6%	53.9%	53.3%
Total		Count	11013793	11312331	22326124
		% within SEX Sex of respondent.	100.0%	100.0%	100.0%

Table 16: Visitors to either an historic site or a museum, differentiated by age.

			1 15 to 17	2 18 to 19	3 20 to 24	4 25 to 29	5 30 to 34	6 35 to 39
histcult Visited either an historic site or a museum	1 Yes	Count	604625	402289	915806	964312	1107304	1272652
		% within AGEGR5 Age group of the respondent.	49.2%	54.3%	47.3%	47.5%	49.2%	51.0%
	2 No	Count	625442	338058	1020472	1065879	1141810	1221481
		% within AGEGR5 Age group of the respondent.	50.8%	45.7%	52.7%	52.5%	50.8%	49.0%
Total		Count	1230067	740347	1936078	2030191	2249114	2494133
		% within AGEGR5 Age group of the respondent.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

AGEGR5 Age group of the respondent.									
7 40 to 44	8 45 to 49	9 50 to 54	10 55 to 59	11 60 to 64	12 65 to 69	13 70 to 74	14 75 to 79	15 80 yearsand over	Total
1183004	1078178	790523	654793	468441	415515	299984	170459	104579	10432264
50.0%	52.5%	45.3%	49.1%	43.9%	42.5%	35.2%	25.9%	17.6%	46.7%
1182013	975327	954669	680098	597446	562400	551855	486686	490226	11893860
50.0%	47.5%	54.7%	50.9%	56.1%	57.5%	64.8%	74.1%	82.4%	53.3%
2365017	2053505	1745192	1334889	1065887	977915	851839	657145	594805	22326124
100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 17: Crosstabulation of responses to question of computer use as medium of leisure-time research with having visited either historic sites or museum within the previous 12 months.

			F41_C3 Media used to improve the knowledge of a		
			1 Yes	2 No	Total
histcult Visited either an historic site or a museum	1 Yes	Count	2012224	2566196	4578420
		% within F41_C3 Media used to improve the knowledge of a	62.6%	58.1%	60.0%
	2 No	Count	1203667	1851972	3055639
		% within F41_C3 Media used to improve the knowledge of a	37.4%	41.9%	40.0%
Total		Count	3215891	4418168	7634059
		% within F41_C3 Media used to improve the knowledge of a	100.0%	100.0%	100.0%

APPENDIX D

UNIVERSITY OF ALBERTA
FACULTY OF ARTS, SCIENCE & LAW RESEARCH ETHICS BOARD

APPLICATION TO CONDUCT RESEARCH INVOLVING HUMAN PARTICIPANTS

Principal Investigator: **Name: Bob Ackroyd**
Department/Faculty: Humanities Computing/Arts
Address: 18489 97A Avenue, Edmonton, Alberta
Phone number: 780-443-1550
E-mail address: ackroyd@ualberta.ca

(*If student*) **Name / Department of Faculty Supervisor / Sponsor: Sean Gouglas / HUCO**
Supervisor's E-mail address: sean.gouglas@ualberta.ca
Supervisor's Campus Phone number: 780-492-3021

Project Title: Smart Art: Applying Digital Technologies To Increase Engagement and Value in Museums and Historic Sites

Funding Source: none

Summary of Project / Research Design.

1) My thesis research concerns applying digital technologies to increase engagement and value in museums and historic sites. It is an exploration of innovative ways in which the use of digital computer technology in interactive displays could enhance the enjoyment and educational experience of museum visitors by powerfully engaging viewer/participants in interesting, reliable, educational and dynamically growing digital interactivity with our cultural heritage. I propose the use of the modern large-screen high-resolution computer monitor as a standard museum display medium for the labeling, describing and exploring of museum art and artifacts on display, and for the interactive use of museum patrons to interface with the museum's vast archival data. Hypermedia access affords the museum patron choices about the depth and breadth of available information they may wish to access. The computer also offers new ways of resolving difficult curatorial issues of preservation and restoration, by offering patrons multiple possible restoration and contextual alternatives while preserving unaltered the historical artifact on display.

2) The research will include open-ended interviews, of no longer than half-hour duration, with museum and historic site directors, managers, curators, designers, planners and consultants.

3) Interviews will be solicited by phone or e-mail requests for appointment, and conducted at the office or institution of the interviewee.

4) All participation will be voluntary. There will be no pressure to answer any question the participant feels would have politically sensitive implications.

5) Interviews will typically be electronically recorded with permission of the interviewee. A four-choice consent form will be used at the beginning of the interviews.

6) Over the months of May June and July, 2006, no more than 20 interviews in all will be conducted of personnel related to no more than 5 museum or historical institutions.

7) Questions will ascertain the historical reasons for current choices in display media, foreseeable problems with interactive computer stations as display media and possible future plans for display enhancement. Questions will vary according to the expertise and background of the individual participants.

8) Typical questions may include:
What is your name, title and institution?
What is your is the nature of your work?
What uses does this institution make of computer technology?
Has or does this institution employ digital interactive computers as a display medium?
What kinds of problems could you foresee with such displays?
What advantages might such a display afford you?
How many visitors does you institution have annually? Is it increasing?
Does the visitation rate vary significantly over the year? How?
Do you keep visitor demographic profile statistics? May I access them?
What visitor feedback or usability mechanisms do you employ?
What implications do these feedback mechanisms offer the digital display idea?
What percentage of your collection is digitally catalogued and archived?
What kinds of digital information do you currently publish on your web site?
How do visitors to your institution access this data?
What plans do you now have to increase public access to your digital data collection?
How many full-time, part-time or voluntary staff work on digital data collection, archiving or presentation?
What plans for expansion in that direction do you foresee?

9) All data will be filed by myself , either electronically or physically in my home, and kept for at least a year and no longer than five years. The data will be accessible to myself, and according to the participant's permission form choice, can be made accessible to my academic advisors and appropriate collaborative scholars working on related academic papers or presentations.

Assessment of Risk to Human Participants:

I do not foresee any risk to the physical or emotional well being of any participant. If the participant feels that there is any risk to his job or social standing, she or he may answer "off-the-record" or end the interview at any time. All requests for confidentiality or anonymity will be strictly observed.

Description of Procedures to be Undertaken to Reduce Risk to Human Subjects. Please attach copies of consent forms and other similar documents.

At the beginning of the interview, and prior to beginning the recording or asking any questions:

1) a brief explanation of the thesis project will be given,

2) permission to record the interview will be requested. If not granted I will request permission to take notes,

3) the Smart Art Museum Project permission form will be signed by the participant, (see form)

4) it will be clearly stated that no statement that a participant feels reflects poorly on their administration or job will be used, that any "don't-quote-me" or "off-the-record" statements will be kept completely confidential, and that they may end the interview at any time without penalty.

I have read the UNIVERSITY OF ALBERTA STANDARDS FOR THE PROTECTION OF HUMAN RESEARCH PARTICIPANTS [GFC Policy Manual, Section 66] and agree to abide by these standards in conducting my research.

Permission Form: The Smart Art Museum Project

_____
(Print Name of Subject)

_____
(Date(s) of Interview)

This document evidences a tape-recorded interview and/or was produced in connection with a tape-recorded interview (hereafter " the documents") conducted for the purposes of a master's thesis research. The purpose of this research is to explore the potential of computer interface as a display medium in art museums and historical sites. Because of the speed of technological innovation, these original documents are expected to become irrelevant over time and will therefore not be preserved beyond five years of the publication of the thesis, other than the references made to them in the thesis, any related published articles or formal scholarly presentations.

I wish to place the following conditions upon the use of this interview, and I understand that scholars will adhere to these conditions to the fullest extent possible. (Check one)

_____ OPEN. The documents may be read and/or heard by researchers of technology relating to museum applications and by other scholars who access the published thesis and/or related published articles. These scholars may quote from, cite, and reproduce the documents without restriction. My name and title may be cited in the thesis and/or related published articles.

_____ MY PERMISSION REQUIRED TO QUOTE, CITE, OR REPRODUCE. The documents are open to examination as stated above under "OPEN." No scholar will quote from, cite, or reproduce by any means the documents except with my written permission.

_____ ANONYMOUS QUOTE. The documents may be used by the primary researcher only. The researcher may quote from the documents, but no citation will include my name or the name and geographic location of the institution with which I am associated.

_____ ANONYMOUS. The documents may be used by the primary researcher only as background information relating to the technological development of museums. Permission is NOT granted to quote, cite or reproduce the documents in any manner including the thesis and any related articles or presentations.

_____
(Signature)

_____
(Date)